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SECTION I
MULTIPLE CHOICE QUESTIONS

C h a p t e r ------ 15

HOMEOSTASIS

2MCQs

I) From Exercise:-

1) The protection of an animal environment from the harms of fluctuations is the definition of which of the followings? (Rwp-16A)
a) Osmoregulation b) Excretion
c) Thermoregulation **d) Homeostasis**

2) The category of the plants that has adaptations of small and thick leaves to limit water loss are called: (Sah-19A, Rwp-15A, 19A, AJK-17A, Grw-16A)
a) Hydrophytes **b) Xerophytes**
c) Mesophytes d) Hygrophytes

3) The environment where animals produce large volumes of diluted urine:
a) Hypotonic aquatic b) Isotonic aquatic
c) Hypertonic aquatic d) Terrestrial

4) Which of the following is called as excretophore i.e. contributing mainly in the elimination of wastes in plants? (Lhr-II-15A, Sah-16A)
a) Stem b) Roots
c) Leaves d) Flowers

5) The excretory product that requires minimum water for its elimination compared to others: (Fsd-18A, Rwp-15A, Sah-17)
a) Urea **b) Uric acid**
c) Creatinine d) Ammonia

6) The groups of animals whose excretory system is structurally associated with nutritive tract:
a) Vertebrates b) Earthworm
c) Planaria **d) Insects**

7) The excretory structures that deliver urine from kidney to urinary bladder:
a) Urethera b) Pelvis
c) Ureter d) Collecting tubule

8) The metabolic wastes that are ingested into the body and must be removed:
a) Pesticides b) Drugs
c) Food additives **d) All of these**

9) Which of the following is not endotherm? (Grw-16A, Mtn-I-18A)
a) Bird **b) Amphibians**
c) Flying insects d) Mammals

10) Name the type of adaptations from the followings that is responsible for shivering thermogenesis:
a) Structural **b) Physiological**
c) Behavioral d) None of these

II) From Punjab Boards:-

1) A diluted solution compared to cell concentration is termed as: (Sah-18A, Rwp-18A) (Lahore Board-New Scheme-Group-I-2014-A)
a) Hypertonic **b) Hypotonic**
c) Isotonic d) Paratonic

2) Number of Ammonia molecules required to produce one molecule of urea is: (Rwp-18A) (Lahore Board-New Scheme-Group-I-2014-A)
a) 1 b) 2
c) 3 d) 4

3) The incidence of calcium oxalate type stones of kidney is: (Lahore Board-New Scheme-Group-II-2014-A) (Lhr-I-15, 16, Dgk-II-14, 15A, Mtn-14A)
a) 50 % b) 60 %
c) 15 % **d) 70 %**

4) Which organ is the central station of metabolism? (Lahore Board-New Scheme-Group-II-2014-A)
a) Liver b) Kidney
c) Spleen d) Skin

5) These have adaptations for reduced rate of transpiration: (Lahore Board-New Scheme-Group-I-2015-A)
a) Xerophytes b) Mesophytes
c) Halophytes d) Hydrophytes

6) 1 g of ammonia nitrogen requires how much water for excretion? (Sah-18A, Fsd-16A, Bwp-19A) (Lahore Board-New Scheme-Group-I-2016-A)
a) 50 ml b) 100 ml
c) 250 ml **d) 500 ml**

7) The body temperature regulation in human is based on complex homeostatic thermostate present in the: (Lahore Board-New Scheme-Group-I-2017-A) (Dgk-II-15A, Sgd-16A, Mtn-II-18A, Dgk-I,19A)
a) Cerebrum b) Medulla oblongata
c) Hypothalamus d) Thalamus

8) Which one of the following structures of kidney is involved in the production of concentrated urine? (Lahore Board-New Scheme-Group-I-2017)
a) Glomerulus **b) Juxtamedullary nephron**
c) Cortical nephron d) Vasa recta

9) The blood vessel supplying the blood to Bowman's capsule is: (Lahore Board-New Scheme-Group-II-2018)
a) Afferent arterioles b) Efferent arterioles
c) Renal artery d) Renal vein

10) The central station of metabolism and the body's central metabolic clearing agent is: (Gujranwala Board-New Scheme-2014 A)
a) Stomach **b) Liver**
c) Cork d) Gut

11) The more concentrated external environment is termed as: (Bwp-18A, Dgk-I-14, Sah-15A) (Gujranwala Board-New Scheme-2015-A)
a) Hypotonic **b) Hypertonic**
c) Isotonic d) Osmotic

12) Which one is not a mesophyte?
(Gujranwala Board-New Scheme-2015-A)
a) Brassica b) Rose
c) Mango **d) Cacti**

13) Urea is produced in:
(Gujranwala Board-New Scheme-2017-A)
a) Lungs **b) Liver**
c) Kidney d) Pancreas

14) Arginase splits the arginine to form urea and:
(Gujranwala Board-New Scheme-2017-A)
a) Ornithine b) Citrulline
c) Creatinine d) Ammonia

15) The fever causing chemical substances in humans are: (Sgd-16A)
(Gujranwala Board-New Scheme-2018-A)
a) Pathogens b) Poisons
c) Pyrogens d) Pyrexin

16) Sunkens stomata are found in which of the following group of plants?
(Gujranwala Board-New Scheme-2018-A)
a) Hydrophytes **b) Xerophytes**
c) Mesophytes d) Bryophytes

17) Saliva and urine are used for evaporating cooling by:
(Multan Board-Old Scheme-2014-A)(Dgk-II-15A)
a) Bats b) Dogs
c) Birds d) Seals

18) The excretory product that requires maximum water for its removal is: (Dgk-I-17)
(Multan Board-New Scheme-2014-A)
a) Ammonia b) Creatinine
c) Urea d) Uric acid

19) The human abdominal cavity is lined by:
(Mtn-II-18A, Dgk-II-17, Sah-17A)
(Multan Board-New Scheme-2014-A)
a) Ectoderm b) Endoderm
c) Peritonium d) Epidermis

20) Mammalian kidney including human is adapted to conserve water upto:
(Multan Board-New Scheme-2015-A)
a) 69.5 % b) 79.5 %
c) 89.5 % **d) 99.5 %**

21) Freshwater protozoans pump out excess water by:
(Multan Board-New Scheme-2015-A)
a) Contractile vacuole b) Food Vacoule
c) Pinocytosis d) Phagocytosis

22) Trimethylamine Oxide is produced in:
(Multan Board-New Scheme-2016-A)(Mtn-19A)
a) Hag fish b) Bonyfish
c) Marine fish **d) Cartilaginous fish**

23) The tolerance of dehydration is:
(Multan Board-New Scheme-2016-A)
a) Osmoconformers b) Osmoregulators
c) Anhydrobiosis d) Dehydration

24) Among the vertebrates, the hagfishes are isotonic with the surrounding:
(Multan Board-New Scheme-Group-I-2017-A)
a) Fresh water **b) Sea's water**
c) Pond's water d) River's water

25) Liver also has numerous crucial functions of:
(Multan Board-New Scheme-Group-I-2017-A)
a) Osmoregulation **b) Homeostasis**
c) Excretion d) Thermoregulation

26) Of all the excretory products, the principal one is:
(Multan Board-New Scheme-Group-II-2017-A)
a) Ammonia b) Urea
c) Uric acid d) Bilirubin

27) The fishes which drink large amount of sea's water and excrete concentrated urine are:
(Multan Board-New Scheme-Group-II-2017-A)
a) Cartilagenous fishes **b) Bony fishes**
c) Lung fishes d) Jawless fishes

28) Glomerular filtrate are reabsorbed in:
(Multan Board-New Scheme-Group-I-2018-A)
a) Proximal tubule **b) Bowman's capsule**
c) Loop of Henley d) Distal tubule

29) Activation of Sweat Glands to produce Sweat for evaporative cooling is a type of adaptation:
(Bahawalpur Board-New Scheme-2014-A)
a) Structural b) Physiological
c) Behavioral d) None of these

30) Freshwater flatworms excrete:
(Bahawalpur Board-New Scheme-2015-A)
a) Very Dilute Urine
b) Very Concentrated Urine
c) Slightly Concentrated Urine
d) Moderately Concentrated Urine

31) The removal of sebum is for:
(Bahawalpur Board-New Scheme-2015-A)
a) Nutrition b) Excretion
c) Protection d) Thermoregulation

32) In bacterial and viral infection, pathogens and leucocytes a chemical called:
(Bahawalpur Board-New Scheme-2017-A)
a) Pyrexia b) Toxin
c) Aflatoxins **d) Pyrogen**

33) High level of Circulating Calcium in the blood is called: (Bahawalpur Board-New Scheme-2017-A)
a) Hypercalcemia b) Hypoglycemia
c) Osteomalacia d) Hyperoxalurea

34) Excretory Structure present in Cockroach is:
(Bahawalpur Board-New Scheme-2018-A) (Dgk-II-14, 18)
a) Contractile Vacoule **b) Malpighian tubules**
c) Neohridia d) Flame cells

35) Uric acid is excreted out as solid excreta in:
(Faisalabad Board-Old Scheme-2014-A)
a) Earthworm **b) Cockroach**
c) Star fish d) Planaria

36) The cuticle is thick, waxy and stomata are in lower depressions of leaves.
(Faisalabad Board-Old Scheme-2014-A)
a) Epiphytes b) Mesophytes
c) Xerophytes d) Hydrophytes

37) What is an endotherm?
(Faisalabad Board-New Scheme-2014-A)(DGK-15A)
a) Birds b) Bats
c) Huming bird d) Reptiles

38) **The nitrogenous waste which is higly toxic and dissolves quickly in body fluids is:**
(Faisalabad Board-New Scheme-2015-A)(DGK-I-14)
a) Ammonia b) Urea
c) Uric acid d) CO_2

39) **Cockroach and other insects remove their nitrogenous wastes in the form of:**
(Faisalabad Board-New Scheme-2015-A)(DGK-I-16A)
a) Ammonia b) Urea
c) Uric acid d) Creatinine

40) **Animals that do not require to adjust their internal osmotic state actively are known as:**
(Faisalabad Board-New Scheme-2016-A)
a) Osmoregulators **b) Osmoconformers**
c) Terrestrial d) Hypertonic

41) **All the collecting tubules of human kidney finally discharge into the:**
(Faisalabad Board-New Scheme-2017-A)
a) Bowman's capsule b) Glomerulus
c) Pelvis d) Urethera

42) **Blood supplied to kidneys from each cardiac beat is:** **(Rawalpindi Board –New Pattern-2014-A)**
a) 10 % **b) 20 %**
c) 30 % d) 50 %

43) **Supercool cytosol without ice formation, is caused by:** **(Rawalpindi Board –New Pattern-2014-A)**
a) Heat shock proteins
b) Unsaturated fatty acids
c) Solutes
d) Enzymes

44) **The lower two pairs of ribs in human are called:**
(Rawalpindi Board-New Scheme-Group-II-2017-A)
a) Free ribs b) Fix ribs
c) Floating ribs d) Former ribs

45) **Which one is an example of Xerophytes?**
(Sargodha Board-New Scheme-2017-A)
a) Brassica b) Rose
c) Mango **d) Cactus**

46) **High degree of renal failure is also called:**
(Sargodha Board-New Scheme-2018-A)
a) Uremia b) Leukemia
c) Anemia d) Lithotripsy

47) **The mechanism of evaporative cooling in respiratory tract of dog is known as:**
(D.G.K. Board-New Scheme-Group-I-2015-A)
a) Panting b) Shivering thermogenesis
b) Thermogenesis d) Vasodilation

48) **Most land Mammals respond to cold by raising their:**
(D.G.K. Board-New Scheme-Group-II-2016-A)
a) Skin **b) Furs**
c) Bristles d) Spines

49) **A pair of kidneys consists of millions of functional units called:**
(D.G.K. Board-New Scheme-Group-II-2017-A)
a) Nephrons b) Neurons
c) Dendrons d) Flatrons

50) **Uric acid is produced from the metabolism of:**
(D.G.K. Board-New Scheme-Group-I-2018-A)
a) Nucleic acid b) Fatty acids
c) Carbohydrates d) Lipids

51) **In each nephron, inner end form a cup shaped swelling called:**
(D.G.K. Board-New Scheme-Group-I-2018-A)
a) Glomerulus b) Henle's loop
c) Bowman's capsule d) Pelvis

52) **Liver acts as a store house for:**
(D.G.K. Board-New Scheme-Group-II-2018-A)
a) Bile b) Albumin
c) R.B.Cs **d) Iron**

53) **Mechanism, which eliminates nitrogenous waste, is referred as:** **(Sahiwal Board-New Scheme-2014-A)**
a) Osmoregulation **b) Excretion**
c) Thermoregulation d) Ejection

54) **Anhydrobiosis refers to tolerate:**
(Sahiwal Board-New Scheme-2014-A)
a) Dehydration b) Hydration
c) Anhydration d) Rehydration

55) **Which of the following is not synthesized in liver?** **(Sahiwal Board-New Scheme-2015-A)**
a) Urea b) Uric acid
c) Albumin **d) Urine**

56) **Non-surgical removal of kidney stone is called:** **(Sahiwal Board-New Scheme-2016-A)**
a) Dialysis **b) Lithotripsy**
c) Uremia d) Kidney transplant

57) **In Juxtamedullary nephrons additional capillaries extend down to form a loop of vessels called:**
(Azad Jammu Kashmir Board-2017-A)(Fsd-14A)
a) Vasa recta b) Peritubules
c) Collecting tubules d) Afferent tubules

III) From Entry Test:-

1) **---------- did not have the adaptations to remove the flooding of their cells in freshwater.** **(Entry Test-2007)**
a) Both b and d c) None of b, d
b) Hydrophytes **d) Xerophytes**

2) **In nephron, most of the reabsorption takes place in the:** **(Entry Test-2012)**
a) Distal tubule c) Ascending limb
b) Proximal tubule d) Descending limb

3) **Detection of change and signaling for effector's response to control system is a:** **(Entry Test-2012)**
a) Negative feedback c) Inter-coordination
b) Positive feedback **d) Feedback mechanism**

4) **Blood enters the glomerulus through:** **(Entry Test-2012)**
a) Efferent arteriole c) Renal artery
b) Afferent arteriole d) Renal vein

5) **Which portion of nephron is under the control of ADH?** **(Entry Test-2012)**
a) Bowman's capsule
b) Ascending arm
c) Distal end and collecting ducts
d) Descending arm

6) Which of the following are the functions of proximal convoluted tubule?
(Self-Test Questions-2013)
a) Ultrafiltration and reabsorption
b) Selective reabsorption and retention of water
c) Selective reabsorption and active tubular secretion
d) Reabsorption of water by the help of ADH

7) The walls of descending limb of loop of Henle are:
(Self-Test Questions-2013)
a) Permeable to water as well as to sodium and chloride
b) Permeable to water but impermeable to salts
c) Impermeable to water and permeable to sodium and chloride
d) Impermeable to both water and salts

8) ADH affects which of the following for retention of Water? (Self-Test Questions-2013)
a) Walls of collecting duct
b) Walls of loop of Henle
c) Glomerulus
d) Proximal convoluted tubule

9) The counter-current multiplier mechanism is shown by which of the following?
(Self-Test Questions-2013)(Entry Test 2014-2015)
a) Loop of Henle
b) Proximal convoluted tubule
c) Distal convoluted tubule
d) Bowma's capsule

10) The site of filterarion in nephron is:
(Entry Test-2013)
a) Glomerulus and Bowman's capsule
b) Proximal and Distal end
c) Ascending and descending arm
d) Loop of Henle

11) Antidiruitic hormone increases the reabsorption of: **(Entry Test-2013)**
a) Amino acid c) Ammonia
b) Salts **d) Water**

12) Active uptake of -------- in the ascending limb or thick loop of Henle is promoted by the action of aldosterone: (Entry Test-2013)
a) K+ c) Ca++
b) Cl- **d) Na+**

13) The process through which the body maintains the internal environment from the fluctuations of external environment is called as:
(Entry Test-2013)
a) Behavior of organism c) Thermoregulation
b) Adaptation **d) Homeostasis**

14) Active pumping out of Na+ occurs at which part of Nephron? (Entry Test-2013)
a) Proximal tubule
b) Descending loop of Henle
c) Ascending loop of Henle
d) Collecting ducts

15) Which one of the following is responsible for the production of concentrated urine?
(Entry Test-2014)
a) Juxtamedullary nephron
b) Cortical nephron
c) Bowman's capsule
d) Distal tube

16) Reabsorption of useful constituents normally takes place in which one of the following?
(Entry Test-2014)
a) Proximal tubule c) Bowman's capsule
b) Distal tubule d) Glomerulus

17) Anti-Diuretic Hormone (ADH) is released from:
(Entry Test-2014)
a) Anterior pituitary lobe
b) Posterior pituitary lobe
c) Hypothalamus
d) Thalamus

18) Which one of the following is the main nitrogenous waste product in humans?
(Entry Test-2014)
a) Urea c) Salts
b) Ammonia d) Uric acid

19) The nephrons which are present along the boarder of cortex and medulla are called: (Entry Test-2015)
a) Juxtamedullary nephrons
b) Cortical nephrons
c) Internal nephrons
d) Outer nephrons

20) When water is in short supply, increased water retention occurs through the: (Entry Test-2015)
a) Cortical nephrons
b) Proximal Convoluted Tubule
c) Juxtamedullary nephrons
d) The tissue of cortex

21) Ascending loop of Henle does not allow outflow of:
(Entry Test-2015)
a) Na+ ions c) Cl- ions
b) K+ ions d) Water

22) Water and sodium ions are reabsorbed in:
(Entry Test-2015)
a) Urinary Bladder and Urethra
b) Ureter
c) Adrenal cortex
d) Proximal Convoluted Tubule and Collecting Duct

23) A large quantity of dilute urine is produced in diabetes incipidus. This disease is due to the deficiency of: (Entry Test-2015)
a) Antidiuretic hormone c) Thyroxine
b) Aldosterone d) Throxine

24) Bowman's capsule continues as extensively convoluted portion known as: (Entry Test-2015)
a) Peritubular capillaries
b) Proximal convoluted tubules
c) Efferent arterioles
d) Afferent arterioles

25) Select the part of nephron which is not permeable to water and stops its outflow: (Entry Test-2017)
a) Glomerulus **c) Ascending loop**
b) Proximal tubule d) Descending loop

26) Vessels which carry blood to the glomerulus are called: (Entry Test-2017)
a) Efferent arterioles c) Vasa recta
b) Renal vein **d) Afferent arterioles**

27) When water content in body becomes high, what will happen? (Entry Test-2017)
a) ADH release will be inhibited
b) ADH will be released in large amount
c) Aldosterone will be released
d) Anterior pituitary will produce ADH

28) The major factor in producing hypertonic urine is: (Entry Test-2017)
a) Glomerulus
b) Influence of aldosterone
c) ADH influencing on collecting duct
d) Gradual increase in osmolarity from cortex to inner medulla

29) What is the least selective process during urine Formation? (Entry Test-2017)
a) Reabsorption
b) Pressure filteration
c) Secretion
d) Differential permeability

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. Differentiate between Osmoconformers and Osmoregulators.
(Lhr-12,14,II-16A, Sah-18A, Grw-16, Fsd-17, DGK-II-15A, Rwp-14,II-17A, Bwp-15,16)

Ans.

Osmoconformers	Osmoregulators
1. The osmotic concentration of their body fluids are equal or isotonic to their surroundings. 2. They do not require actively to adjust their internal osmotic state. 3. Most marine invertebrates are osmoconformers. Among vertebrates hagfishes are osmoconformers. Marine cartilaginous fishes are osmoconformers but are ionregulators.	1. Their body fluid concentrations differ noticeably the outside environment. 2. They actively regulate to discharge excess water in hypotonic and excrete salts in hypertonic environment. 3. Some marine invertebrates are osmoregulators. Marine bony fishes are osmoregulators. All freshwater fishes are osmoregulators. Terrestrial animals are invariably osmoregulators.

2. Define Anhydrobiosis with an example.
(Bwp-19A, Lhr-I-19A, Lhr-12,14-II-18, Bwp-16, Rwp-II-17A, DGK-II-15,16, Fsd-14A)

Ans.
1. Anhydrobiosis refers to tolerate dehydration.
2. It differs in various animals.
3. It enables animals to survive the loss of all body water and desiccation.

Examples: -
a. Tardigrade (Water bear), an invertebrate of about 1mm.
b. Some invertebrates, such as several species of nematodes, literally have the ability to dry up under adverse conditions.
(Note:- In a situation of extreme desiccation, an animal stops all its metabolic processes preventing reproduction, development and repair. When conditions become favorable for the animal, it will return to its metabolic state of life).

3. Why does filtration take place only at glomeruli part of nephron and nowhere else?

Ans. Filtration Taking place only at Glomeruli Part of Nephron: -
Filtration takes place only at glomeruli part of nephron and nowhere else because:
a. Glomeruli walls are porous and;
b. Fraction of the blood reaching glomeruli part provides the filteration pressure.

4. Mention two metabolic altered states that generally (70 %) cause kidney stone formation.

Ans. The two metabolic altered states, that generally (70 %) cause kidney stone formation, are:
1. Hypercalcemia — A raised level of calcium in the blood
2. Hyperoxalurea — A high level of oxalates in urine

5. What is a Renal Failure? (Lhr-I-17A, Bwp-16A)

Ans.
1. Renal failure is a condition in which kidneys fail to filter waste products from blood and excrete them in urine as a result of which urea and other nitrogenous wastes start accumulating in the blood.
2. In renal failure, there is an increase in the plasma level of urea and other nitrogenous wastes. The rise in plasma level of urea causes complications of increase in blood pressure and anemia etc.
3. Usual causes of renal failure are various factors of pathological and chemical nature that may destroy the nephron, particularly its glomerular part.
4. Renal failure occurs in two main categories:

a. Acute Renal Failure, in which the kidneys abruptly stop working entirely or almost entirely but may eventually recover nearly normal function, and
b. Chronic Renal Failure, in which the function of the kidney is completely lost and is unable to remove nitrogenous wastes.

6. Account one each main adaptation in plants to high And low temperatures.

Sol. A) One Adaptation in Plants to High Temperature:-
The plants living in temperate regions manage with the stress of 40 ^{0}C and above temperature by synthesizing Heat Shock Proteins that prevent the denaturation of enzymes and other proteins.

B) One Adaptation in Plants to Low Temperature:-
Plants respond to cold stress by increasing proportion of unsaturated fatty acids, which help membrane to maintain structure at low temperature by preventing crystal formation, however, this adaptation requires time.

II) From Punjab Boards:-

1. What are hydrophytes? What are their important adaptations?
(Lahore Board-Acedemic Session-2012-2014)
(Group-II-2014-A)

Sol.

A) Hydrophytes: -
The plants which are found in freshwater habitat either partly or completely submerged are called Hydrophytes.

B) Their Important Adaptations: -
Hydrophytes have adaptations to remove the flooding of their cells in freshwater, such as large surface area of leaves to transpire water excessively and extensive stomata on the upper surface to promote loss of water

2. What is extracorporeal shockwave lithotripsy?
(Lahore Board-Acedemic Session-2012-2014)
(Group-I-2014-A)

Sol. Extracorporeal Shock Wave Lithotripsy: -
Extracorporeal shockwave lithotripsy is the most common in which high concentration of X-ray or ultrasound are directed from a machine outside the body to the stone inside to locate the stone, that is broken down by shock waves produced by a device into pieces or into sand and pass out of the body in urine.

3. Differentiate between shivering thermogenesis and non-shivering thermogenesis.
(Grw-18, Fsd-17, Dgk-II-17, 18)
(Lahore Board-New Scheme-Group-I-2015-A)

Ans.

Shivering Thermogenesis	Non-Shivering Thermogenesis
1. Production of heat by involuntary contractions of the skeletal muscles is called Shivering Thermogenesis. 2. Control center for shivering thermogenesis is located in the posterior hypothalamus. 4. During shivering thermogenesis, heat is produced by increased muscle contraction by movements or by shivering.	1. Production of heat triggered by hormones is called Non-Shivering Thermogenesis. 2. Control center for non-shivering thermogenesis lies in the anterior hypothalamus. 4. During non-shivering thermogenesis, basal metabolism is raised and heat is produced by secretion of thyroxine (in long term) and adrenaline (in short term).

4. What is haemodialysis? Give its importance.
(Sgd-18A, Lhr-II-19A)
(Lahore Board-New Scheme-Group-I-2015-A)(Mtn-II-18)

Sol. A) Haemodialysis
Hemodialysis means 'cleaning the blood'. In this procedure blood is circulated through a machine which contains a dialyzer also called an artificial kidney. Dialyzer has two spaces separated by thin membrane. Blood passes from one side of the fluid and dialyzing fluid on the other. The wastes and excess water pass from the blood through the membrane into the dialysis fluid.

B) Importance of Haemodialysis: -
Dialysis is a technique used to remove waste products from the blood and excess fluids from the body as a treatment for chronic renal failure.

5. Define endotherms and heterotherms.
(Sgd-18A, Lhr-II-19A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. A) Endotherms: -
1. Endotherms are the animals that generate heat by metabolism and keep it in the body.
2. They have high rate of metabolism even when they are inactive.
3. Maintenance of their body temperature is independent of environmental temperature.
4. They use structural, physiological and behavioral mechanisms to regulate body temperature.
5. They can operate effectively in fairly low temperatures, so they can live in cold regions. Their activity also does not depend on daily and seasonal temperature.
6. Birds and mammals are endotherms. Endotherms also include some fishes and flying insects.

B) Heterotherms: -
Heterotherms are the animals that generate heat of varying degree so their body temperature is kept in a wide range.

Examples: -
Bats, Humming birds etc.

6. Give four adaptations of Xerophytes.
(Lhr-I-16, 18, Sgd-14, DGK-I-19)
(Lahore Board-New Scheme-Group-II-2015-A)

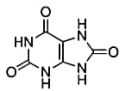
Sol. Four Adaptations of Xerophytes.: -
1. Many xerophytes possess small, thick leaves to limit water loss by reducing surface area proportional to the volume.
2. Their cuticle is thick, waxy and leathery.
3. Stomata are on lower surface of leaves and located in depression.
4. Some, as cacti, during the driest season, shed their leaves to restrict water loss completely.

7. Write structural formula of urea and uric acid.
(Lahore Board-New Scheme-Group-II-2015-A)
(DGK-I-14,II-17)

Sol. Structural Formulae of Urea and Uric Acid: -

a. Structural Formula of Urea: -

b. Structural Formula of Uric Acid: -



8. What are heat shock proteins? (Lhr-II-16, Mtn-15)
(Lahore Board-New Scheme-Group-I-2016-A)

Sol. Heat Shock Proteins: -

Heat Shock Proteins are special proteins produced by most plants, especially plants of temperate regions, in response to high temperature (40^0 C or above) that prevent the denaturation of enzymes and other proteins.

9. Difference between afferent and efferent arterioles.
(Lahore Board-New Scheme-Group-I-2016-A)

Sol. Difference Between Afferent and Efferent Arterioles:

Afferent Arteriole	Efferent Arteriole
1. It is derived from renal artery.	1. It is derived from glomerulus.
2. Blood arrives the glomerulus through afferent arterioles.	2. Blood leaves the glomerulus through efferent arterioles.
3. It provides the blood to glomerulus for filteration.	3. It provides blood that is not filtered in the glomerulus to peritubular capillaries and vasa recta.

10. What is hypertonic environment and what changes occur in a cell in such environment?
(Lahore Board-New Scheme-Group-I-2016-A)

Sol. A) Hypertonic Environment: -

The more concentrated external environment is termed as Hypertonic Environment.

B) Changes Occurring in a Cell in Hypertonic Environment: -

1. Hypertonic environment renders cell solutions concentrated.
2. It shrinks the cell due to loss of water.

11. What is lithotripsy?
(Lhr-I-18, Mtn-I-18, Rwp-I-17, Sgd-14A, Sah-18)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Lithotripsy: -

a. Lithotripsy is the technique used for non-surgical removal of kidney stone.
b. It is used to break up stones that form in the kidney, ureter or gall bladder.
c. Extracorporeal shockwave lithotripsy is the most common in which high concentration of X-ray or ultrasound are directed from a machine outside the body to the stone inside to locate the stone, that is broken down by shock waves produced by a device in tiny pieces or into sand and pass out of the body in urine.

12. What is counter current multiplier?
(Lhr-II-18, Grw-14, 15, Sgd-14, DGK-II-18, Lhr-I-19)
(Lahore Board-New Scheme-Group-I-2017-A)

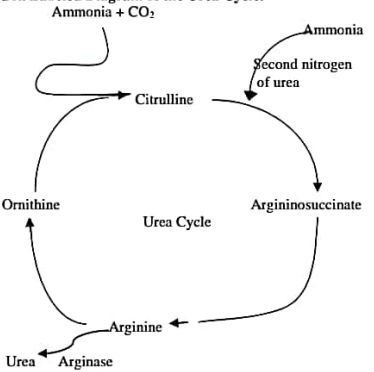
Sol. Counter Current Multiplier: -

a. The repetitive re-absorption of sodium chloride by the thick ascending loop of Henle and continued inflow of new sodium chloride from proximal tubule into the loop of Henle is called the Counter Current Multiplier.
b. The interstitial fluid or interstitium of kidney is gradually concentrated from cortical to medullary part through Counter Current Multiplier which is completed in the following steps.

i. First, there is gradual outflow of water from the filtrate back to kidney as it passes downward in the descending loop of Henle.
ii. Subsequently, ascending loop of Henle does not allow outflow of water from its filtrate, instead actively transport sodium ions into kidney interstitium to sustain its high concentration.
iii. The sodium ions removed from the ascending limb slowly diffuse back into descending limb maintaining highest concentration of solutes in the inner medulla.

13. Draw and label the urea cycle.
(DGK-I-19, Grw-15, 16, Mtn-16, DGK-II-16, Ajk-17, Rwp-I-17, Sah-19A)
(Lahore Board-New Scheme-Group-I-2018-A)

Sol. Labeled Diagram of the Urea Cycle: -



14. Differentiate between hemodialysis and peritoneal dialysis.

(Lahore Board-New Scheme-Group-II-2018-A)

Sol. Differences Between Haemodialysis and Peritoneal Dialysis: -

Hemodialysis	Peritoneal Dialysis
1. It is done outside the body with artificial kidney, the dialyzer. 2. The basic principle of hemodialysis is to pass blood channels bounded by a thin semipermeable membrane in a dialyzer. On the either side of the membrane is a dialyzing fluid into which urea and other wastes in the blood pass by diffusion.	1. It is done inside the body. 2. Peritoneal membrane is utilized as semipermeable membrane. Dialysis fluid is filled in peritoneal cavity through catheter. Wastes and excess water from the blood vessels lining the peritoneum cavity seep through the peritoneal membrane into the dialyzing fluid in the cavity. The fluid is then changed regularly to repeat the process.

15. Define homeostasis. (Bwp-14, Fsd-14A)

(Gujranwala. Board (New Course) 2014-A)

Sol. Homeostasis: -

a. The protection of internal environment from the harms of the fluctuations in external environment is termed as homeostasis.

b. It is a set of regulatory mechanisms which are involved in maintaining an organism's internal environment within suitable limits.

c. The homeostasis keeps the internal fluctuations in a narrow range with various control systems compared to wider external fluctuations. It usually involves some form of feedback self-regulation.

16. Name waste products produced during metabolism of purine and pyrimidine.

(Gujranwala Board-New Scheme-2016-A)

Sol. Names of Waste Products Produced during Metabolism of Purine and Pyrimidine: -

a. Hypoxanthine
b. Xanthine
c. Uric acid
d. Allontoin
e. Urea
f. Ammonia

17. Compare hypertonic environment and hypotonic environment. (Grw-18, 19A, Sah-19A)

(Gujranwala Board-New Scheme-2017-A)

Sol. Comparison of Hypertonic and Hypotonic Environment:

Hypotonic Environment	Hypertonic Environment
1. It is a more diluted external environment with lower concentration of solute than the cytoplasm of a cell. 2. Water enters into the cell causing it to swell or turgid. 3. It renders cell solutions diluted.	1. It is a more concentrated external environment with a higher concentration of solute than the cytoplasm of a cell. 2. Water diffuses out of the cell causing it to shrink. 3. It renders cell solutions concentrated.

18. What is hypercalcemia, write its effects?

(Gujranwala Board-New Scheme-2017-A)

Sol. A) Hypercalcemia: -

1. It is high level of circulating calcium in the blood.
2. It occurs due to other diseases.

B) Effects of Hypercalcemia: -

It is a contributing factor in the formation of calcium oxalate as well as calcium phosphate stones.

19. Discuss the process of osmoregulation in mesophytes.

(Gujranwala Board-New Scheme-2018-A)

Sol. Process of Osmoregulation in Mesophytes: -

a. They have developed a water proof external cuticle on stem and leaves to prevent excessive transpiration.

b. They open stomata in sufficient supply of water to promote loss of excess water and close stomata in restricted supply of water to prevent its lost.

20. Define Mesophytes. Give an example. (Rwp-19A)

(Multan Board (New Scheme) (A) 2014)

Sol. Mesophytes: -

a. Mesophytes are the plants which grow in normally well-watered soil.

b. They have moderate water availability.

c. They have developed a water proof external cuticle on stem and leaves to prevent excessive transpiration.

d. They open stomata in sufficient supply of water to promote loss of excess water and close stomata in restricted supply of water to prevent its lost.

e. Usually the water which they lose by transpiration is readily replaced by uptake from soil, and so they require no special means of conserving water.

21. What are Osmoconformers?
(Multan Board (New Scheme) (A) 2014)

Sol. Osmoconformers: -

a. The animals, whose body fluids are kept isotonic to external environment even for marine saltwater environment, are called Osmoconformers.
b. Osmoconformers are in osmotic equilibrium with their environment.
c. There is no need for these animals to osmoregulate.
d. Most marine invertebrates are osmoconformers. Among vertebrates, only primitive hagfish are strict osmoconformers. Sharks, rays and other cartilaginous fishes are also isotonic to seawater due to retention of urea in their blood, even though their blood level of sodium chloride is lower than that of sea water.

22. Differentiate between Ureotelic and Uricotelic Animals.
(Multan Board (New Scheme) (A) 2014)(Sah-17A, Sgd,19A)

Sol. Differences Between Ureotelic and Uricotelic Animals:-

Ureotelic Animals	Uricotelic Animals
1. These animals usually excrete urea as their main nitrogenous wastes. 2. Urea which these animals excrete is more toxic than uric acid, highly soluble in water. 3. These animals live in areas where moderate amount of water is available. 4. Terrestrial mammals are ureotelic. In addition to mammals, most amphibians, sharks, some bony fishes also excrete urea. Humans excrete little uric acid but urea is the predominant nitrogenous waste.	1. These animals excrete uric acid as excretory product. 2. Uric acid which these animals excrete is less toxic than urea, highly insoluble in water. 3. These animals inhabit arid environment. 4. Terrestrial animals such as birds, many reptiles, insects, terrestrial snails and other gastropods are uricotelic.

23. Define Glomular Filtrate. (Sgd-16)
(Multan Board-New Scheme-2015-A)

Sol. Glomular Filtrate: -

1. The filterate appearing in Bowman's capsule is called as glomerular filtrate.
2. It is actually the fluid that is filtered from glomerular capillaries into Bowman's capsule.
3. It contains numerous useful substances such as glucose, amino acids, salts etc. in aqueous solution.
4. The glomerular filtrate contains all constituents of blood except for the plasma proteins and red blood cells.

24. Define Panting with one example. (Mtn-II-17)
(Multan Board-New Scheme-2015-A)

Sol. A) Panting: -

a. It is the evaporative cooling in the upper respiratory tract.
b. During panting metabolic rate of the body is decreased so less heat is generated by the body.

B) One Example: -
Panting is found in dogs.

25. What are Juxtamedullary Nephrons? Give their importance. (Multan Board-New Scheme-2016-A)
(Rwp-16A, Bwp 19-A)

Sol. A) Juxtamedullary Nephrons: -
The nephrons arranged along the boarder of cortex and medulla with their tubular system looping deep in the inner medulla, are called juxtamedullary nephrons.

B) Importance of Juxtamedullary Nephron:
They are involved in the production of concentrated urine.

26. Write structural adaptations for regulation of heat exchange between animals and environment.
(Fsd-15A, Rwp-19A, Sgd-17, Sah-19A)
(Multan Board-New Scheme-2016-A)

Sol. Structural Adaptations for Regulation of Heat Exchange Between Animals and Environment: -

1. Long term changes in sub-dermal fatty layer insulation and pelage
2. Presence of sweat glands
3. Lungs modified for panting

27. What is Hyperoxaluria? What are its effects?
(Multan Board-New Scheme-Group-I, II-2017-A)

Sol. Hyperoxaluria: -
Hyperoxalurea is the high level of oxalates in urine as well as in blood.

B) Effects of Hypeoxalurea: -
It is a contributing factor in the formation of calcium oxalate stones in the kidney, the incidence of which is about 70% of all the kidney stones.

28. Write two important functions of Liver.
(Multan Board-New Scheme-Group-I-2017-A)

Sol. Two Important Functions of Liver: -

a. It synthesizes nitrogenous wastes such as NH_3, urea and uric acid.
b. It converts excess glucose in blood to glycogen, lactic acid to glycogen and stored glycogen to glucose.

29. How Osmoregulation takes place in Marine Environment? (Sah-15A)
(Multan Board-New Scheme-Group-I-2017-A)

Sol. Osmoregulation in Marine Environment: -

a. Osmoregulation in Marine Invertebrates:
Most marine invertebrates are osmoconformers.

b. Osmorgulation in Hagfishes: -
Hag fishes are also osmonformers, that is, they are isotonic with the surrounding sea's water.

c. Osmoregulation in Cartilaginous Fishes: -
They maintain lower internal salt concentration that of surrounding sea water by storing high concentration of urea in their body. Because urea in high concentration is damaging, so these fishes retain another chemical trimethyleamine oxide for protection against urea. Thus they do not have problem of water loss. Excess salts are removed by special glands in their rectum (rectal glands) and by gills.

d. Osmoregulation in Marine Bony Fishes: -
Marine bony fishes have hypotonic internal environment so they lose water. Thus, in order to conserve water they constantly drink water. The salts taken in along water are actively excreted by gills. Moreover they excrete concentrated urine resulting in maximum salt excretion and minimum water loss.

30. What do you mean by Pyrexia and Pyrogens? (Multan Board-New Scheme-Group-II-2017-A)(Rwp-19A)

Sol. A) Pyrexia: -

Pyrexia or Fever or High Temperature means a body temperature above the normal due to a resetting at a higher level of the thermostat mechanism in the hypothalamus that helps in stimulating the protective mechanism against the pathogens.

B) Pyrogens: -

Pyrogens are chemical substances produced during bacterial and viral infections from the pathogens and leukocytes that display the set point of hypothalamus above the normal point of 37^0 C and cause fever.

31. Why temperature of body increases during fever? Explain.

(Multan Board-New Scheme-Group-I-2018-A)

Sol. Reason: -

Temperature of body increases during fever because during infection, certain substances called pyrogens are released from pathogens, leucocytes and degenerating tissues that displace the set point of hypothalamus above the normal point of 37 ^{0}C increasing the temperature above normal.

32. What is Uremia? Give its treatment.

(Multan Board-New Scheme-Group-II-2018-A) (DGK-II-16-17)

Sol. Uremia and Its Treatment: -

1. Uremia is a high degree of renal failure.
2. It is also called end-stage renal disease.

B) Permanent Treatment of Uremia: -

Surgical implantation of a matching donor kidney is the permanent treatment of uremia.

33. How the most plants have adapted to survive in heat stress? (Bahawalpur Board-New Scheme-2014-A) (DGK-II-19A)

Sol. Adaptations of Plants to Survive in Heat Stress: -

a. Plants use evaporative cooling to manage with high temperature.
b. Most plants also respond to high temperature by synthesizing Heat Shock Proteins that prevent the denaturation of enzymes and other proteins.

34. How mammals thermorgulate in cold environment? (Bahawalpur Board-New Scheme-2017-A)

Sol. Mammals Thermorgulating in Cold Environment:-

Mammals thermorgulate in cold environment by following way:

a. Skin blood vessels of mammals constrict, diverting blood from skin to deeper tissues and reducing heat loss from skin surface.
b. They raise their furs, thereby trapping the thick layer of still air that acts as good insulator between animal skin and the surroudings.
c. Humans have a layer of fat just beneath the skin as insulating material against heat loss.
d. Marine mammals, such as whales and seals, have a very thick layer of insulating fat called as blubber just under the skin.

35. Define Dialysis. Give its types.

(Bahawalpur Board-New Scheme-2017-A)

Sol. Dialysis And Its Types: -

Dialysis is a technique used to remove waste products from the blood and excess fluids from the body as a treatment for chronic renal failure.

There are two methods of dialysis.

a. **Hemodialysis** ---- It is done outside the body with artificial kidney, the basic principle of which is to pass blood through minute cannels bounded by a thin membrane. On the other side of the membrane is a dialyzing fluid into which unwanted substances in the blood pass by diffusion.
b. **Peritoneal dialysis** ---- It is done inside the body in which peritoneal membrane is utilized as semipermeable membrane.

36. Describe thermostat function and feedback controls in human. (Bahawalpur Board-New Scheme-2017-A)

Sol. A) Thermostat Function: -

Thermostat in humans detects temperature change, e.g. of increase and signal to control centre for action of cooling systems and the vice versa.

B) Feedback Control in Human: -

Feed back control in human is the detection of change and signalling for effectors response to control system.

37. Why leaves are said to be excretophore?

(Bahawalpur Board-New Scheme-2018-A) (DGK-II-19A, Sgd-18A, Lhr-II-19)

Sol. Why Leaves Said To Be Excretophore: -

Leaves are called excretophores because plants get rid of accumulated wastes by falling of yellow leaves in the autumn.

38. What are Pyrogens? Give their functions.

(Bahawalpur Board-New Scheme-2018-A)

Sol. A) Pyrogens: -

These are chemical substances produced during bacterial and viral infections from the pathogens and leukocytes.

B) Function of Pyrogens: -

Their function is to displace the set point of hypothalamus above the normal point of 37 ^{0}C causing fever.

39. What is Glomerulus?

(Bahawalpur Board-New Scheme-2018-A)

Sol. Glomerulus: -

a. Glomerulus is a round ball or network of capillaries, laying inside the cup of Bowman's capsule.
b. It circulates blood through Bowma's capsule as it arrives through afferent arterioles and leaves the capsule by efferent arterioles.
c. From the glomerulus, blood is carried by efferent arteriole to pertitubular capillaries and vasa recta.
d. It is the place where blood passing through it, is filtered into Bowman's capsule.

40. Differentiate between vasodilation and vasoconstriction.
(Faisalabad Board-New Scheme-2015-A)

Sol. Differences Between Vasodilation and Vasoconstriction:

Vasodilation	Vasoconstriction
1. It is expansion of the diameter of blood vessels. 2. Vasodilation happens when the arterioles supplying the capillaries in the skin's surface increase in size, resulting an increase blood supply to the surface skin. 3. Due to vasodilation, skin capillaries become fill with warm blood and heat radiates from skin surface.	1. It is narrowing of diameter of blood vessels. 2. It occurs when the arteriole supplying blood to the capillaries in the surface layer of the skin constrict, so reducing the flow of blood to the skin's surface. 3. Due to vasoconstriction, blood is diverted from skin to deeper tissues and amount of heat lost through the surface is reduced.

41. What is pyrexia and its importance?
(Faisalabad Board-New Scheme-2015-A)
(Bwp-19A, Fsd-18A, Rwp-II-17, 18A)

Sol. A) Pyrexia: -
Pyrexia means a body temperature above the normal due to a resetting at a higher level of the thermostat mechanism in the hypothalamus.

B) Importance of Pyrexia: -
It helps in stimulating the protective mechanisms against the pathogens.

42. Write the phenomenon of lithotripsy.
(Faisalabad Board-New Scheme-2017-A)

Sol. Phenomenon of Lithotripsy: -
Patient lies down in the bed supported by a device placed at the level of kidneys. X-ray imaging system or an ultrasound imaging system is used to locate the stone. Shock waves are generated by the device outside and are focused on the stone inside. These shock waves break the stone in tiny pieces or into sand, which are passed out of the body in urine.

43. What are excretophores and why?
(Faisalabad Board-New Scheme-2018-A)
(DGK-I-15, Rwp-19A)

Sol. A) Excretophores: -
Excretophores are the organs of plants which are used for the disposal of excretory products from plants.

B) Why?
Plants get rid of their accumulated wastes by falling of yellow autumn leaves, hence these leaves are called excretophores

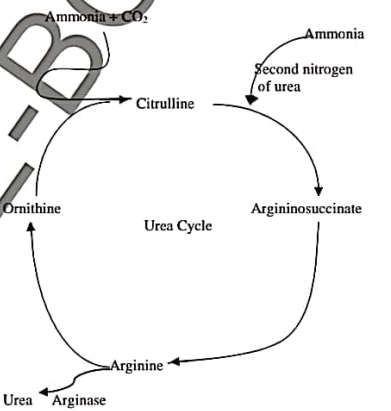
44. What is peritoneal dialysis? Explain. (Sah-16A)
(Rawalpindi Board-New Pattern-2015-A)

Sol. Peritoneal Dialysis: -
Peritoneal Dialysis work on the same principle as Haemodialysis except that abdomen has a peritoneal cavity lined by a thin epithelium called peritoneum. Peritoneal cavity is filled with dialysis fluid that enters the body through a catheter. Excess water and wastes pass through the peritoneum into the dialysis fluid. This process is repeated several times a day.

45. Briefly describe urea cycle. (Sah-16A)
(Rawalpindi Board-New Pattern-2015-A)

Sol. Urea Cycle: -
1. The metabolic pathways involved in the production of urea are termed as Urea Cycle.
2. Following steps take place in urea cycle:

a. Ammmonia (first source of nitrogen) and CO_2 unite with Ornithine (already available precursor from previous cycle) to form Citrulline.
b. Citrulline condenses with another molecule of ammonia (second source of nitrogen) to form Argininosuccinate.
c. Argininosuccinate is hydrolyzed into Arginine and Fumarate.
d. The arginine is split by arginase to form urea and precursor ornithine for next cycle.



46. Write a note on kidney transplantation. (Sah-16A)
(Rawalpindi Board-New Pattern-2015-A)

Sol. A Note on Kidney Transplantation: -
a. Kidney transplantation is a surgical procedure in which matching donor kidney is transplanted to a patient (recepient) with uremia.
b. Dialysis cannot be done in uremia hence the surgical transplantation of matcing donor kidney is the only option left for as the permanent treatment.
c. A close relative may volunteer as potential donor.
d. It is successful in 80 % of cases.

47. What is blubber and in which animal is it found? (Rawalpindi Board-New Pattern-2018-A)(AJK-17)

Sol. A) Blubber: -

a. Blubber is a very thick layer of insulating fat just under the skin in marine mammals living in much colder water than their body temperature.
b. It accounts for about 25 % of their body weight.
c. It protects them from the cold.

B) In Which Animal Blubber Found: -

Blubber is found in aquatic mammals such as seals, whales, dolphin, walrus etc.

48. Differentiate between osmoregulation and thermoregulation. (DGK-I-15, 17) (Rawalpindi Board-New Pattern-2018-A)

Sol. Differences Between Osmoregulation and Thermoregulation: -

Osmoregulation	Thermoregulation
1. It involves maintaining a balance between water and solute contents of cells of organisms. 2. It keeps body fluids or cytoplasm from becoming too dilute or too concentrated.	1. It is the ability of organisms to maintain body temperature within narrow range. 2. It limits the internal temperature of the body within a range that enables it to function effectively.

49. Differentiate between ureotely from uricotely. (Sargodha Board-New Scheme-2014-A)

Sol. Ureotely Different From Uricotely: -

Ureotely	Uricotely
1. It is the pattern of excreting urea by the animals. 2. It requires more water than uricotely. 4. It is found in mammals, most amphibians, shark and some bony fishes.	1. It is the pattern in which animals excrete uric acid. 2. It requires little water loss, hence conserves more water than ureotely. 4. It is found in birds, insects, many reptiles and land snails.

50. Define Excretophores and Anhydrobiosis. (Sargodha Board-New Scheme-2017-A)

Sol. A) Excretophores: -

Excretophores are the organs of plants, such as leaves, which are used for the disposal of excretory products from plants.

B) Anhydrobiosis: -

It is the characteristic of some animals to tolerate dehydration.

51. What are different metabolic wastes in human? (D.G.K. Board (New Course) Group-II (2014-A)

Sol. Different Metabolic Wastes in Human: -

a. **Urea** -- Produced from the metabolism of amino acids
b. **Uric acid** --- Produced from the the metabolism of nucleic acis
c. **Creatinine** --- Produced from metabolism of muscle creatine
d. **Bilirubin** --- End products of hemoglobin breakdown
e. **Metabolites of various hormones**
f. **Pesticides, drugs and food addeditives**

52. Define Excretion. (D.G.K. Board-New Course-Group-I-2016-A)

Sol. Excretion: -

a. The elimination of wasteful metabolites, mainly of the nitrogenous nature is called Excretion.
b. Among the assimilated nutrients in animals, carbohydrates and lipids are metabolized to CO_2 and H_2O. Protein and nucleoprotein metabolism produces waste nitrogen in various forms in different animals. The waste nitrogen proves toxic if it is concentrated in the cell, therefore, it must be removed from the body. Thus excretion is the mechanism which eliminates these nitrogenous wastes from the body and depends upon the availability of water in animals.
c. In contrast, the mechanism of excretion in plants is different. Plants in their autotrophic mode of life produce CO_2 and H_2O as the excretory products. Plants also produce several organic and inorganic compounds which are stored for various purposes and are also removed when necessary.

53. Differentiate between Hypotonic and Hypertonic solutions. (D.G.K. Board-New Course-Group-I-2016-A)

Sol. Differences Between Hypotonic and Hypertonic Solutions: -

Hypotonic Solution	Hypertonic Solution
1. **Hypotonic** is a solution with low solute concentration than the cytoplasm of a cell. 2. Water enters into to the cell causing it to swell or turgid. 3. It renders cell solution diluted.	1. **Hypertonic** is a solution with higher solute concentration than the cytoplasm of a cell 2. Water diffuses out of the cell causing it to shrink. 3. It renders cell solutions concentrated.

54. What is the evolutionary significance of ureotely and uricotely? (D.G.K. Board-New Course-Group-I-2018-A)

Sol. Evolutionary Significance of Ureotely and Uricotely: -

Ureotely and Uricotely are evolutionary adaptations of nitrogenous wastes in their habitats.

55. Write different methods of kidney stone removal. (D.G.K. Board-New Course-Group-I-2018-A)

Sol. Different Methods of Kidney Stone Removal: -

a. Surgical Removal of Kidney Stones: -

Kidney stones have been removed by kidney surgery.

b. Non-Surgical Removal of Kidney Stones or Lithotripsy: -

i. Presently, non-surgical removal of kidney stones or Lithotripsy is widely used to break up stones that form in the kidney, ureter or gall bladder.
ii. There are several methods of lithotripsy but extracorporeal shock wave lithotripsy is the most common and advanced method in which shock waves are focused on the stone to break the stone into tiny pieces or into sand which are passed out of the body in urine.

56. Describe the role of aldosterone and anti diuretic hormone in kidney.
(D.G.K. Board-New Course-Group-I-2018-A)

Sol. A) Role of Aldosterone in Kidney: -
Aldosterone actively uptake of sodium in the ascendinding limb or thick loop of Henle.

B) Role of Anti Diuretic Hormone in Kidney: -
Anti Diuretic hormone actively reabsorbs water from filterate in collecting tubules into blood by the kidneys.

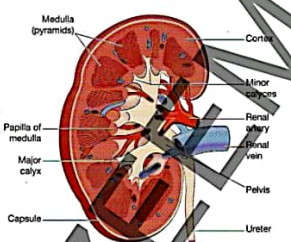
57. Differentiate between re-absorption and secretion in nephron.
(D.G.K. Board-New Course-Group-II-2018-A)

Sol. Differences Between Re-Absorption and Secretion in Nephron: -

Reabsoprtion in Nephron	Secretion in Nephron
1. Reabsorption is the transfer of substances from renal tubules into the peritubular capillaries. 2. It mostly occurs in proximal tubules. 3. About 65 % of the filtered sodium and water are reabsorbed and slightly lower percentage of filtered chloride are reabsorbed by the proximal tubule.	1. Tubular secretion is the transfer of material from peritubular capillaries to the renal tubular lumen. 2. It occurs from the epithelial cells that line the renal tubules and collecting ducts. 3. Substances mainly secreted into renal tubule are H^+, K^+, NH_3, urea, creatinine and drugs.

58. Draw and label human kidney.
(Sahiwal Board-New Scheme-2015-A)

Sol. Labeled Diagram of Human Kidney: -



A longitudinal section of the right kidney.

59. What is Vasa recta? Write its function.
(Azad Jammu Kasmir Board-2017-A)

Sol. A) Vasa Recta
Vasa recta is a loop of specialized peritubular Capillaries in juxta medullary nephrons that extend side by side with the loop of Henley.

B) Function of Vasa: -
It reabsorbs useful constituents of the glomeeulus filtrate.

SECTION III

LONG QUESTIONS

1. Write a note on osmoregulation in marine animals. (4) (DGK-I-14A, DGK-II-16) (Lahore Board (Session-2012-2014-Group-I-2014-A)

2. Explain excretion in plants. (4) (DGK-II-14A, Lhr-I-18A, Mtn-I-17A, DGK-I-19, Grw-17A, Bwp-16A, 17) (Lahore Board (Session-2012-2014-Group-II-2014-A)

4. Describe osmoregulation in animals. (4) (Lahore Board-New Scheme-Group-II-2015-A)

5. What is endoskeleton? Describe bone and cartilage. (4) (Lahore Board-New Scheme-Group-I-2016-A)

7. Discuss major homeostatic functions of the liver. (Mtn-II-18, Bwp-18, Lhr-I-17) (Lahore Board-New Scheme-Group-II-2018-A)

8. Write a note on thermoregulation in plants. (4) (Sah-17A, Lhr-II-19A) (Gujranwala Board-New Scheme-2014-A)

9. Give osmoregulatory adaptations in terrestrial animals. (4) (Gujranwala Board-New Scheme-2016-A)

10. Describe the mechanism of thermoregulation in mammals. (4) (Gujranwala Board-New Scheme-2018-A) (Fsd-14A, Ajk-17A, Bwp-15A)

11. Explain Urinary System of Human. (4) (Mtn-II-17A, DGK-II-18A) (Multan Board-New Scheme-2015-A)

12. Discuss Kidney problems and cure. (4) (Multan Board-New Scheme-2016-A)

13. Discuss the nature of excretory products in different habitats. (4) (Sah-15A, Rwp-18A) (Multan Board-New Scheme-Group-I-2018-A)

14. Explain working of Nephron in Human Kidney. (4) (Bahawalpur Board (New Scheme) (2014-A)

15. Describe kidney as osmoregulatory organ. (4) (Faisalabad Board-New Scheme-2015-A)

16. Describe the role of liver as an excretory organ. (4) (DGK-II-17A, Fsd-17A) (Faisalabad Board-New Scheme-2016-A)

17. What is Renal failure? Describe its cure. (4) (Rawalpindi Board-New Pattern-2014-A)(DGK-I-16A)

18. Define osmoregulation and describe osmoregulation in plants. (4) (Rawalpindi Board-New Pattern-2015-A) (Grw-15A)

19. Discuss the structure and function of Nephron. (4) (Rwp-19A, DGK-II-19A, Sah-19A) (Rawalpindi Board-New Pattern-2016-A)

20. Discuss the temperature classification of Animals. (4) (Sargodha Board-New Scheme-2017-A)

21. Discuss adaptations in plants low and high temperature. (4) (Sargodha Board-New Scheme-2018-A) (Bwp-19A, Mtn-14A, Fsd-18, DGK-I-16, 17A)

Chapter ---- 16

SUPPORT AND MOVEMENT

2MCQs

I) From Exercise:-

1) **Which of these is a direct source of energy for muscle contraction?**
   a) ATP b) Creatine phosphate
   c) Lactic acid **d) Both a and b**
2) **When muscle contracts:**
   a) Sarcomeres increases in size
   b) Myosin slides past actin
   c) Lactic acid is produced
   d) Both a and b
3) **Which of the following changes occur when skeletal muscle contracts:**
   a) The A band shorten **b) The I band shorten**
   c) The Z-line slide farther apart
   d) The actin filament contract
4) **Thin filament in myofibrils consists of:**
   a) Actin, tropomyosin, troponin b) Z line
   c) Myosin d) Sarcomere
5) **The contraction of striated muscle is initiated by the release of energy in the presence of:**
   a) Acetyl choline **b) Calcium ion**
   c) Chloride ion d) Iron
6) **In the mammalian skeleton there is a distinct synovial joint between the:**
   a) Bones of cranium **b) Humerus and ulna**
   c) Sacrum and ileum
   d) Sternum and floating ribs
7) **Which of the following is a bone of axial skeleton? (Grw-19A)**
   a) Rib b) Shoulder girdle
   c) Pelvis d) Femur
   e) All of the above
8) **Vertebral column includes:**
   a) Sacrum b) Coccyx
   c) Cervical, thoracic and lumber vertebrae
   d) All of the above
9) **In mammal the numbers of cervical vertebrae are: (Fsd-16)**
   a) No definite number **b) Seven**
   c) Eleven d) Varies with size of neck
10) **Brain is protected by:**
    a) Cranium b) Skull
    c) Orbits d) All of these
12) **Brachioradialis causes the uplift of:**
    a) Radius b) Ulna
    c) Both a and b d) Humerus
13) **Molting occurs in the arthropods at the:**
    a) Immature stage b) Mature stage
    c) Both stages d) Do not undergo molting
14) **Muscle fatigue is caused by:**
    a) CO_2
    b) Accumulation of lactic acid
    c) Fumaric acid
    d) Ethyl alcohol
15) **Cardiac muscles are:**
    a) Voluntary **b) Involuntary**
    c) Both a and b d) None of the above

II) From Punjab Boards:-

1) **The thick filament which are 16 nm in diameter are composed of:**
   (Lahore Board-Old Scheme-Group-II-2014-A)
   a) Actin **b) Myosin**
   c) Tropomyosin d) Troponin
2) **Ball and socket joint allows the movement in:**
   (Lahore Board-Old Scheme-Group-II-2014-A)
   a) One direction b) Two directions
   c) Four directions **d) Several directions**
3) **Which one of the following is not a joint disease?**
   (Lahore Board-New Scheme-Group-I-2014-A) (Rwp-18A, Sgd-16A)
   a) Arthritis **b) Sciatica**
   c) Disc slip d) Spondolysis
4) **Most efficient way of supporting the body is seen in: (Lahore Board-New Scheme-Group-I-2014-A)**
   a) Fishes b) Aves
   c) Reptiles **d) Mammals**
5) **Which one is not a bone of axial skeleton?**
   (Lahore Board-New Scheme-Group-II-2014-A)
   a) Ribs b) Sternum
   c) Pelvic d) Cranium
6) **Which animal has long narrow wings?**
   (Lahore Board-New Scheme-Group-II-2014-A)
   a) Gull b) Owl
   c) Crow d) Eagle
7) **A condition in which palatine processes of maxilla palatine fail to fuse is:**
   (Lahore Board-New Scheme-Group-I-2015-A)(Fsd-18A)
   a) Microcephaly **b) Cleft palate**
   c) Fused palate **d)** Osteoarthritis
8) **The superacoracoid muscles provide power for the: (Lahore Board-New Scheme-Group-I-2015-A)**
   a) Upward stroke b) Downward stroke
   c) Recovery stroke d) Neutral stroke
9) **The collenchyma cells have protoplast and usually lack:**
   (Lahore Board-New Scheme-Group-II-2015-A)
   a) Primary wall **b) Secondary wall**
   c) Middle lamella d) Vacoule
10) **Which of the following cells have angular thickening in their primary walls? (Sah-18A,Bwp-15A)**
    (Lahore Board-New Scheme-Group-I-2016-A)
    a) Collenchyma b) Sclerenchyma
    c) Fibers d) Vessels
11) **Collagen fibers of bone are hardened by the deposit of:**
    (Lahore Board-New Scheme-Group-I-2017-A)
    a) Calcium phosphate b) Sodium phosphate
    c) Sodium carbonate d) Calcium carbonate

12) **The synovial joint is surrounded by a layer of connective tissue called: (Grw-18A) (Lahore Board-New Scheme-Group-I-2017-A)**
a) Ligament b) Nucleus pulposus
c) Annulus fibrosus **d) Fibrous capsule**

13) **Sclerenchyma has thick secondary walls usually impergenated with: (Fsd-17A, DGK-I-17) (Lahore Board-New Scheme-Group-II-2018)**
a) Chitin b) Pectin
c) Silica **d) Lignin**

14) **The inactive non-conducting wood is called: (Gujranwala Board-New Scheme-2014-A)(Grw-19A)**
a) Heartwood b) Sapwood
c) Cork d) Bark

15) **Bowed legs and deformed pelvis are the symptoms of which disease in children? (Gujranwala Board-New Scheme-2015-A)**
a) Rickets b) Disc slip
c) Sciatica d) Haematoma

16) **Which is the end of muscle which remains fixed when muscles contracts? (Gujranwala Board-New Scheme-2015-A)**
a) Insertion **b) Origin**
c) Tendon d) Belly

17) **Muscle is connected to bone by: (Gujranwala Board-New Scheme-2016-A)(Mtn-14A)**
a) Tendon b) Ligament
c) Z-line d) Cross briges

18) **Thick filament in myofibrils is made up of: (Gujranwala Board-New Scheme-2016-A)**
a) Actin **b) Myosin**
c) Tropomyosin d) Troponin

19) **Tetanus is caused by: (Gujranwala Board-New Scheme-2017-A)**
a) Bacteria b) Virus
c) Fungi d) Protist

20) **Skeletal muscle fibers have diameter: (Gujranwala Board-New Scheme-2017-A)(Grw-18A)**
a) 100-200 µ **b) 10-100 µ**
c) 10-100 nm d) 100-1000 µ

21) **The sclerenchyma cells found in seed coats and nut shells are the: (Multan Board-New Scheme-2014-A)**
a) Fibers b) Vessels
c) Trachieds **d) Sclereides**

22) **The process of moulting is controlled by the nervous system and a hormone called: (Multan Board-New Scheme-2015-A)**
a) Aldosterone b) Androgen
c) Ecdysone d) Oxytocin

23) **The membrane that bounds vacuole is called: (Multan Board-New Scheme-2015-A)**
a) Epiblast **b) Tonoplast**
c) Chloroplast d) Hypoblast

24) **The loss of water due to ex-osmosis from plant cells causes plants to: (Mtn-17A-18, Sgd-18A, DGK-I-16,II-19) (Multan Board-New Scheme-2016-A)**

25) **The sleep movement of plants fall under the category of: (Multan Board-New Scheme-2016-A)**
a) Growth b) Tactic
b) Turgor d) Tropic

26) **Sacrum is formed by fusion of anterior: (Multan Board-New Scheme-Group-I-2017-A)**
a) Two bones b) Three bones
c) Four bones d) Five bones

27) **A disease caused by low level of calcium in the blood is called: (Multan Board-New Scheme-Group-II-2017-A)**
a) Cramp b) Paralysis
c) Tetany d) Tetanus

28) **Rickets is a disease in children with bowed legs and deformed ----------. (Multan Board-New Scheme-Group-II-2018-A)**
a) Head **b) Pelvis**
c) Chest d) Arms

29) **Muscles in the Gut Wall are: (Bahawalpur Board-New Scheme-2014-A)**
a) Smooth b) Skeletal
c) Cardiac d) Voluntary

30) **Mature bone cells are called: (Bahawalpur Board-New Scheme-2014-A)**
a) Osteocytes b) Osteoclasts
c) Chondrocytes d) Blastocytes

31) **Collenchyma and Sclerenchyma cells are heavily lignified cells in: (Bahawalpur Board-New Scheme-2017-A)**
a) Cortex and Phloem **b) Cortex and Xylem**
c) Xylem and Phloem d) Pericycle and Cortex

32) **Which of the following muscle straightens the Elbow Joint? (Bahawalpur Board-New Scheme-2017-A)**
a) Brachialis **b) Triceps**
c) Biceps d) Brachioradialis

33) **Rickets is caused by deficiency of: (Bahawalpur Board-New Scheme-2018-A)**
a) Vitamin A b) Vitamin B
c) Vitamin C **d) Vitamin D**

34) **Hinge joint allows the movement of bones in: (Faisalabad Board-Old Scheme-2014-A)**
a) Two directions b) Three directions
c) Four directions d) All directions

35) **An increase in plant girth due to the activity of vascular cambium is called: (Faisalabad Board-New Scheme-2014-A)(Bwp-19A)**
a) Primary growth **b) Secondary growth**
c) Sap wood d) Heart wood

36) **Slightly elastic connective tissues that attach bone to bone are called: (Faisalabad Board-New Scheme-2014-A)(DGK-II-14A)**
a) Tendons b) Brachialis
c) Brachioradialis **d) Ligament**

37) In thoracic region, the number of vertebrae is:
(Faisalabad Board-New Scheme-2015-A)
a) 12 b) 15
c) 5 d) 4

38) Sciatia is characetized by stabbing pain radiating over the course of:
(Faisalabad Board-New Scheme-2016-A)
a) Sciatic artery **b) Sciatic nerve**
c) Sciatic vein d) Sciatic capillary

39) Bone forming cells are known as:
(Faisalabad Board-New Scheme-2017-A)
a) Osteoblasts b) Osteocytes
c) Osteoclasts d) Chondroblasts

40) Acute forms of arthritis usually result from:
(Rawalpindi Board–New Pattern-2014-A)
a) Bacterial invasion b) Viral invasion
c) Fungal invasion d) Severe injury

41) Which of the following has hydrostatic skeleton?
(Rawalpindi Board-New Pattern-2015-A)
a) Man b) An inseect
c) Sea anemone d) Fish

42) Seven vertebrae lie in the neck region, called:
(Rawalpindi Board-New Pattern-2016-A)
a) Lumber region b) Thoracic region
c) Pelvic region **d) Cervical region**

43) The joint that allows the movements in two directions is called:
(Rawalpindi Board-New Pattern-2016-A)
a) Cartilaginous joint b) Synovial joint
c) Hinge joint d) Ball and socket joint

44) Skeletal muscles are called striated (stripped) because of presence of:
(Rawalpindi Board-New Scheme-Group-I-2017-A)
a) Red and Yellow band
b) White and Yellow band
c) Alternating light and dark band
d) Red and black band

45) Turgor pressure is generated by osmotic pressure of:
(Rawalpindi Board-New Scheme-Group-I-2017-A)
a) Cell cytosol **b) Cell vacuole**
c) Cytoplast d) Protoplast

46) The lower two pairs of ribs in humans are called:
(Rawalpindi Board-New Scheme-Group-II-2017-A)
a) Free ribs b) Fix ribs
c) Floating ribs d) Former ribs

47) The inflammatory or degenerative disease that damages joints:
(Rawalpindi Board-New Scheme-Group-II-2017-A)
a) Arthritis b) Osteoprosis
c) Meningitis d) Spondylosis

48) The bone which provides attachment site for muscles is: **(Sgd-16A)**
(Rawalpindi Board-New Pattern-2018-A)
a) Compact bone b) Spongy bone
c) Cartilage d) Hip bone

49) The number of lumber vertebrae in human beings is: **(Sargodha Board-New Scheme-2017-A)**
a) 5 b) 7
c) 9 d) 12

50) Joints that are held together by short fibers embedded in connective tissue:
(D.G.K Board-New Scheme-Group-I-2014-A)
a) Fibrous joints b) Cartilaginous joints
c) Synovial joints d) Hinge joints

51) The disease which causes immobility and fusion of vertebral joints is called: **(Lhr-I-19A)**
(D.G.K Board-New Scheme-Group-II-2014-A)
a) Disc slip b) Sciatica
c) Arthritis **d) Spondylosis**

52) All of the following bones are associated with coxal bones, except:
(D.G.K Board-New Scheme-Group-I-2015-A)
a) Illium b) Ischium
c) Pubis **d) Clevicle**

53) The fusion of four posterior vertebrae present in the pelvic region form: **(Fsd-18A)**
(D.G.K. Board-New Scheme-Group-II-2016-A)
a) Sacrum b) Lumbar
c) Coccyx d) Chest cage

54) The number of pelvic vertebrae in vertebral column of man is:
(D.G.K. Board-New Scheme-Group-I-2017-A)
a) 5 b) 7
c) 9 d) 12

55) The hardened outer surface to which internal muscles can be attached is:
(D.G.K. Board-New Scheme-Group-II-2017-A)
a) Exoskeleton b) Hydrostatic skeleton
c) Exoskeleton d) Axial skeleton

56) A mass of clotted blood that forms at the fracture site is called:
(D.G.K. Board-New Scheme-Group-II-2017-A)
a) Haemahuma b) Callus
c) Haemoglobin **d) Haematoma**

57) The earliest form of muscles to evolve is:
(D.G.K. Board-New Scheme-Group-II-2018-A)
a) Cardiac muscles **b) Smooth muscles**
c) Skeletal muscles d) Involuntary muscles

58) Complete immobilization of muscle leads to:
(Sahiwal Board-New Scheme-2014-A)
a) Increase in capillaries
b) Increase in Mitochondria
c) Severe atrophy
d) Resistance to fatigue

59) Brain is protected by:
(Sahiwal Board-New Scheme-2014-A)
a) Cranium b) Skull
c) Orbits d) Zygomatic bone

60) Mature bone cells are called as:
(Sahiwal Board-New Scheme-2015-A)
a) Osteoblasts **b) Osteocytes**
c) Osteoclasts d) Chondrocytes

61) Turgor pressure is generated by high osmotic pressure of the cell: (Sahiwal Board-New Scheme-2016-A)
a) Cytoplasm b) Vacoule
c) Mitochondria d) Chloroplast

62) The vertebral column of human consist of vertebrae: (Sahiwal Board-New Schem-2018-A)
a) 31 b) 32
c) 33 d) 34

63) In reptiles, which vertebra is modified for rotational movements? (Azad Jammu Kashmir Board-2017-A)
a) Atlas **b) Axis**
c) Cervical d) Pelvic

64) Which one is most common in thigh and hip muscles? (Azad Jammu Kashmir Board-2017-A)
a) Muscle fatigue b) Tetany
c) Cramp d) Tetanus

III) From Entry Test:-

1) Neck has ---------- type of joint.(Entry Test-2007)
a) Ball and socket c) Hinge
b) Pivot d) Fibrous

2) Which of the following belong to collenchyma cells? (Entry Test-2007)
a) Fibers c) Sclereides
b) Vessels d) None of these

4) Which of following is made up of bones and cartilage? (Entry Test-2007)
a) Endoskeleton c) Hydrostatic skeleton
b) Exoskeleton d) Both a and b

5) Which disease causes immobility and fusion of vertebral joint? (Entry Test-2007)
a) Sciatica c) Disc slip
b) Spondylosis d) Rickets

6) Which disease is caused by low calcium in the blood? (Entry Test-2007)
a) Tetany c) Muscle fatigue
b) Cramp d) Sciatica

7) Each muscle fiber is surrounded by a membrane which is called: (Entry Test-2012-2013)
a) Sarcomere c) Twitch fiber
b) Sarcolemma d) Capsule

8) When calcium ions are released from the sarcoplasmic reticulum they bind with --------- during muscle contraction. (Entry Test-2012-2013)
a) Tropomyosin c) Cytosol's ions
c) Sarcomere **d) Troponin**

9) Human and mammalian skeleton can be divided into two parts, axial skeleton and --------- (Entry Test-2012)
a) Appendicular skeleton
b) Exooskeleton
c) Endoskeleton
d) Hydroskeleton

10) Last four vertebrae in humans are fused to form a structure called: (Entry Test-2012)
a) Sacrum c) Pubis
b) Cervical vertebrae **d) Coccyx**

11) How many bones are involved in the formation of each half of pelvic girdle? (Entry Test-2012)
a) 3 bones c) 2 bones
b) 4 bones d) 5 bones

12) Muscle fatigue is due to accumulation of: (Self-Test Questions-2013)
a) Lactic acid c) Glucose
b) ATP d) Fats

13) Diameter of skeletal muscle fiber is: (Self-Test Questions-2013)
a) 2-50 um **c) 10-100 um**
b) 30-90 um d) 1-80 um

14) Lining of digestive system contains the: (Self-Test Questions-2013)
a) Skeletal muscle c) Cardiac muscle
b) Skeletal and cardiac muscles **d) Smooth muscle**

15) The most abundant type of bone found on moveable joints is: (Self-Test Questions-2013)
a) Bone c) Fibro-cartilage
b) Hyaline cartilage d) Bone and fibro-cartilage

16) The vertebral column consists of: (Self-Test Questions-2013 E.T-2017)
a) 33 c) 28
b) 30 d) 38

17) The length of myofibril from one Z-band to the next is described as: (Entry Test-2013)
a) Sarcolemma **c) Sarcomere**
b) Sarcoplasm d) Muscle fiber

18) The Ca ++ ions released during a muscle fiber contraction attach with: (Entry Test-2013)
a) Myosin **c) Troponin**
b) Actin d) Tropomyosin

19) The joint that allows the movement in several directions is called: (Entry Test-2013)
a) Hinge joint c) Cartilagenous joint
b) Ball and Socket joint d) Fibrous joint

20) Where can we find H zone in the figure of fine structure of skeletal muscle's myofibril? (Entry Test-2013)
a) In the mid of A band c) Besides the Z-line
b) In I band d) Along the I band

21) First vertebra of cervical region of vertebral column is known as: (Entry Test-2013)
a) Atlas c) Thoracic
b) Sacral d) Axis

22) In a human vertebral column, the number of ------- vertebrae is 7: (Entry Test-2014)
a) Cervical c) Lumber
b) Thoracic d) Sacrum

23) Which one of the following structures holds the bones together? (Entry Test-2014)
a) Joints c) Fibrous capsules
b) Cartilages **d) Ligaments**

24) Which one of the following cartilages is the most abundant in the hyman body? (Entry Test-2014)
a) Elastic cartilage c) Fibrous cartilage
b) Chondrous cartilage **d) Hyaline cartilage**

25) **The repeated protein pattern of myofibrils is called:** **(Entry Test-2014)**
a) Sarcomere c) Sarcolemma
b) Zyomere d) Cross bridges

26) **When more energy is required in muscle contraction then that energy can also be produced by ---------- as a secondary source.** **(Entry Test-2014)**
a) Glucose c) Fructose
b) Phosphocreatine d) Lactic acid

27) **The total number of cervical and thoracic vertebrae in human vertebral column is:** **(Entry Test-2015)**
a) 7 c) 14
b) 19 d) 33

28) **The sarcolemma of muscle fiber folds inwards and forms a system of tubes which runs through the sarcoplasm called:** **(Entry Test-2015)**
a) Myofilaments
b) Sarcoplasmic reticulum
c) Z-lines
d) Transverse tubules

29) **According to sliding filament theory, when muscle fibers are stimulated by the nervous system, which of the following changes occurs?** **(Entry Test-2015)**
a) I bands shorten
b) H zone becomes more visible
c) Z lines move further apart
d) A band shortens

30) **If lactic acid build in thigh muscles, it causes muscle tiredness and pain. This condition is called:** **(Entry Test-2015)**
a) Muscle fatigue c) Cramps
b) Tetany d) Oxygen debt in muscles

31) **Brain is protected and enclosed in:** **(Entry Test-2016)**
a) Lumber vertebrae c) Vertebral column
c) Coccyx **d) Cranium**

32) **Longest bone in the human skeleton is:** **(Entry Test-2016)**
a) Ulna c) Tibia
b) Fibula **d) Femur**

33) **Hips and shoulder are examples of:** **(Entry Test-2016)**
a) Hinge joints
b) Ball and Socket Joints
c) Synovial Joints
d) Cartilagenous Joints

34) **In pelvic region of human body, sacrum is formed by the fusion of:** **(Entry Test-2016)**
a) 4 Vertebrae c) 6 Vertebrae
b) 5 Vertebrae d) 3 Vertebrae

35) **Each muscle fiber is surrounded bya modified cell membrane called:** **(Entry Test-2016)**
a) Sarcolemma c) Myosin filament
b) Sarcomere d) Myofilament

36) **Spongy bone is always surrounded by:** **(Entry Test-2017)**
a) Compact bone c) Osteoblast cells
b) Cartilage d) Osteoclast cells

37) **Bone matrix is hardened by the:** **(Entry Test-2017)**
a) Haversian canals c) Bone marrow tissues
b) Canalicullfs **d) Calcium phosphate**

38) **The number of bones forming skull in man is:** **(Entry Test-2017)**
a) 8 c) 20
b) 14 **d) 22**

39) **W.O.F changes occur skeletal muscles contract:** **(Entry Test-2017)**
a) I-band shortens only
b) A-band shortens and Z-lines move apart
c) I-band shortens and Z-lines come close to each other
d) Actin filaments contract

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. Differentiate

I) From Exercise:-

QUESTIONS

1. What is the cause of cramps?

Sol. Cause of Cramp: -
It is caused due to low blood sugar level, electrolyte dpletion, dehydration, and irritability of spinal cord and neurons.

2. What is the difference between tetanus and muscle tetany? **(DGK-I-15, Lhr-I-18)**

Sol.

Tetanus	Tetany
1. It is an acute infectious disease. 2. It is caused by exotoxins produced by a Gram positive anaerobic bacterium, *Clostridium tetany*. 3. The exotoxin produced by bacteria influences neuromuscular activity and causes paroxysmal muscular spasm which becomes more severe and is fatal in many cases.	1. It is not an infectious disease. 2. It is caused by low level of calcium in the blood. 3. Low level of calcium in the blood excites the neurons which triggers muscle twitching rapidly leading to convulsion and death in case of respiratory organs.

3. What is a ligament?

Sol. Ligament: -

1. A ligament is a cord or band of fibrous connective tissue uniting two bones.
2. It is commonly found in association with joints.
3. It is elastic in nature.
4. It stretches to allow limited movement at joints.

5. How many ribs do not attach with sternum?

Sol. Number of Ribs not Attached with Sternum: -

Two ribs do not attach with sternum.

6. How rickets are produced?

Sol. Rickets are produced when, due to deficiency of vitamin D and consequently calcium deficit, old bones are absorbed and new un-calcified weak bones take their place resulting in bowing of legs and deformation of pelvis.

7. What is the cause of tetanus?

Sol. Cause of Tetanus: -

The cause of tetanus is the powerful exotoxin secreted by a Gram positive bacillus, *Clostridium tetani*.

8. How muscle fatigue is produced?

Sol. During heavy or prolonged exercise when enough oxygen is not available muscle cells receive supply of ATP through anaerobic breakdown of glucose. During this process glucose is converted into lactic acid. Accumulation of lactic acid (lactate) in the muscle is poisonous and in high concentration dangerous. It causes muscle pH to drop and the muscles to ache. Hence the person feels a pain which produces the tiring condition of the muscle known as muscle fatigue.

9. Distinguish between the following:

a. Axial skeleton and appendicular skeleton
c. Osteocytes and osteoblasts
d. Brachialis and brachioradialis
e. Origin and insertion of muscles
f. Bone and cartilage (Sah-14A)
g. Troponin and tropomyosin

Sol. Differences Between: -

a. Axial Skeleton and Appendicular Skeleton: -

Axial Skeleton	Appendicular Skeleton
1. It forms the axis of the body or it is located along the central axis of the body.	1. It forms a system of levers to provide mobility to the body.
2. The axial skeleton includes the skull, the vertebrae, the ribs and the sternum.	2. Appendicular skeleton includes the lis and pectoral and pelvic girdles that attach them to the axial skeleton.
3. It supports and protects the organs of head, neck and chest.	3. The pectoral girdle and upper limbs are specialized for flexibility while pelvic girdle and lower limbs are specialized for strength.

c. Osteocytes and Osteoblasts: -

Osteocytes	Osteoblasts
1. They are mature bone cells.	1. They are bone forming cells.
2. They are the entrapped osteoblasts within the bony matrix deposited by themselves.	2. They are actively moving bone cells which are formed from stem cells.
3. They do not perform the active bone forming-duty. However they are involved in the hormonally regulated exchange of calcium between bone and the blood.	3. They are involved in active bone forming duty such as secretion of spongin matrix, deposition of calcium phosphate in the matrix, etc.

d. Brachialis and Brachioradialis: -

Brachialis	Brachioradialis
1. It is originated from the front of lower half of the humerus.	1. It is originated from the lateral supracondylar ridge of humerus.
2. It is inserted into the ulna.	2. It is inserted into the radius.
3. It is a strong flexor of the elbow joint.	3. It flexes fore arm at elbow joint; rotates fore arm to the mid prone position.

e. Differences Between Origin and Insertion of Muscles: -

Origin	Insertion
It is the end of muscle which remains fixed when muscle contracts.	It is the end of muscle that moves the bone.

f. Differences Between a Bone and Cartilage: -

Bone	Cartilage
1. It is most rigid form of connective tissue.	1. It is the soft and flexible form of connective tissue.
2. Bone is highly vascular tissue.	2. No blood vessel penetrates in to the cartilage.
3. Bone has three types of cells i.e. Osteoblast, Osteocyte, and Osteoclast.	3. The living cells of cartilage are called Chondrocytes.
4. The main protein in the matrix is collagen which is hardened by calcium phosphate.	4. Collagen is not hardened by calcium phosphate.

g. Differences Between Troponin and Tropomyosin: -

Troponin	Tropomyosin
1. It is a trimer composed of three polypeptide subunits.	1. It is rod shaped dimer consisting of two polypeptide chains.
2. Troponin binds at a specific site on each tropomyosin dimer and is repeated at 40 nm intervals along each tropomyosin strand.	2. Subunits of tropomyosin coil around each other to form a helix.

II) From Punjab Boards:-

1. What is synovial joint?
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Synovial Joint: -

a. Synovial joints contain a cavity filled with fluid.
b. These joints are adapted to reduce friction between the moving joints.
c. These joints are surrounded by a layer of connective tissue called fibrous capsule which is lined internally by synovial membrane.
d. Some parts of capsule may be modified to form distinct ligament, holding the bones together.
e. Based on structure and movements allowed, synovial joints can be classified into:
   i. Hinge joint
   ii. Ball and socket joint.

2. What are sources of energy for muscle contraction?
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Sources of Energy for Muscle Contraction: -

1. ATP obtained by aerobic breakdown of glucose.
2. ATP obtained from anaerobic breakdown of glucose
3. Creatin phosphate

3. Differentiate between fibers and sclereides.
(Lhr-II-15A, Mtn-16A, I-18)
(Lahore Board-New Scheme-Group-II-2014-A)

Sol.

Fibers	Sclereides
1. They are long tapered cells. 2. They are usually grouped together in strands and occur as solid bundles or bundle caps. 3. They are particularly abundant in the wood (xylem), inner bark, and leaf ribs (veins) of flowering plants. 4. They give support and provide strength. They provide flexibility to the stem and leaves.	1. They are not elongated. They are more varied in shape. 2. They may occur singly or in groups. 3. They are found in seed coats and nut shells. 4. They play a role of protection as much as support. The hardness of the nuts and seed coats is due to sclereids. They also give pears and other fruits their gritty texture.

4. Name the types of cells associated with bones.
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. Names of the Types of Cells Associated with Bones:

1. Osteoblasts ---- Bone forming cells
2. Osteocytes ---- Mature bone cells
3. Osteoclasts ---- Bone dissolving cells

5. What is foramen trioseum? How it is formed?
(Lahore Board-New Scheme-Group-I-2015-A)(Fsd-15A)

Sol. Foramen Trioseum and Its Formation: -

A) Forrmen Triosseum: -
It is a cavity in the thoracic region of birds.

B) Formation of Triosseum: -
It is formed between the scapula, coracoid and clavicle bones.

6. Give composition of exoskeleton in mollusks and arthropods.
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. A) Composition of Exoskeleton in Molluscs: -
Exoskelton of molluscs consists of shells of one or two pieces. Some molluscs have crystals of calcium carbonate in their shells (e.g. shells of marine bivalvia and snails), while other or lack hard minerals and are much lighter (e.g. shells of land snail).

B) Composition of Exoskeleton in Arthropods: -
Exoskeleton of is composed of epicuticle (made up of waxy lipoprotein) and procuticle (made up of chitin, tough leathery, polysaccharide and several kinds of protein).

7. Differentiate between fibers and sclereides.
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. See Answer No. 3

8. What is rickets? Give its treatment.
(Lahore Board-New Scheme-Group-II-2015-A)
(Bwp-15A, DGK-II-14A, I-16A, Sah-18A)

Sol. A) Rickets: -
It is a disease in children in which bones are soft and deformed. It deforms pelvis and legs in children. The legs of the affected child become incapable of bearing the weight of his body and become bowed.

B) Treatment of Rickets: -
It is treated by vitamin D fortified milk and exposing skin to sunlight.

9. Differentiate between hyaline and fibro cartilage.
(Lahore Board-New Scheme-Group-I-2016-A)
(Grw-14A, Rwp-16A, Fsd-14A, DGK-II-17A)

Sol.

Hyaline Cartilage	Elastic (Fibro) Cartilage
1. It has high proportions of matrix with small amount of collagen fibers. 2. It has great resistance to wear. 3. It is incapable of repair when fractured. 4. It is found at the movable joints.	1. It has small amount of matrix containing bundles of collagen fibers. 2. It is very flexible. 3. If damaged, it repairs itself slowly. 4. It forms external pinnae of ears and epiglottis.

10. What is sciatica and its causes?
(Lahore Board-New Scheme-Group-I-2016-A)(DGK-I-19A)

Sol. Sciatica And Its Cause: -

1. Sciatica is characterized by stabbing pain radiating over the course of sciatic nerve.
2. It may result in a number of lower limb impairment depending upon the precise root injured.

B) Causes of Sciatica: -

1. The cause of sciatica is the injury of proximal sciatic nerve due to a fall.
2. Sciatica may develop due to herniation of disc.
3. Sciatica may also develop due to improper administration of an injection into the buttock.

11. Name the unpaired facial bones.
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. 1. Mandible
2. Vomer

12. What is haematoma formation?
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Haematoma Formation: -

It is a mass of clotted blood formed at the fracture site due to fracture of bone and tearing of blood vessels in the bone itself or surrounding tissues resulting hemorrhage. Soon after, bone cell deprived of food begin to die and the tissue at the fracture site becomes swollen and hence painful.

13. Differentiate between ligaments and tendons.
(Sah-16A)
(Lahore Board-New Scheme-Group-I-2017-A)

Sol.

Ligament	Tendon
1. It attaches bone to bone.	1. It attaches muscle to bone.
2. It is elastic in nature.	2. It is non-elastic.
3. It stretches to allow movement.	3. It does not stretch, so the pull of the muscle is transmitted directly to the bone.

14. What is the difference between tetanus and muscle Tetany?
(Mtn-15A, II-18, Grw-16A, Lhr-II-18, Rwp-15A)
(Lahore Board-New Scheme-Group-I-2018-A)

Sol. See Exercise Chapter No: 16 Answer No: 2

15. Differentiate the compact bone and spongy bone. Give only two differences. (Mtn-I-17A)
(Lahore Board-New Scheme-Group-I-2018-A)

Sol.

Compact Bone	Spongy Bone
1. It is the outer shell of bone.	1. It is the interior of bone.
3. It has no blood vessel.	3. It is rich in blood vessels.

16. Define antagonistic movement of muscles. (Grw-14A)
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. Antagonistic Movement of Muscles: -

Antagonistic movement of muscles is the process in which two muscles work or function in opposite or antagonistic fashion, what one can do other can undo.

Example: -

Movement at elbow joint is produced by antagonistic movement of a muscle pair. They act against each other. In the elbow muscle pair consists of the biceps and triceps. Contraction of biceps bends (flexes) the arm, contraction of triceps straightens (extends) the arm. When either muscle contracts, the other normally relaxes.

17. Compare hinge joint with ball and socket joint.
(Lahore Board-New Scheme-Group-II-2018-A)

Sol.

Hinge Joint	Ball and Socket Joint
1. These joints resemble the hinge on a door.	1. In ball and socket joints, a ball-shaped head of one bone fits in a socket like concavity of another.
2. I allows movement in two directions.	2. This allows movement in several directions.
3. At these joints, a pair of muscles is arranged in the same plane as that of joints.	3. Several pairs of muscles are attached to each of the bones of the joint usually perpendicular to each other.
4. Examples of hinge joints are elbow, knee and ankle joints.	4. The shoulder and hip joints are good examples of this type of joint.

18. Write two differences between sclerenchyma and collenchyma cells. (Fsd-14A, DGK-II-16A, Sah-14A)
(Gujranwala Board (New Course) 2014-A)

Sol.

Sclerenchyma Cells	Collenchyma Cells
1. They are dead at maturity.	1. They are alive at maturity.
2. They have primary as well as secondary cell walls.	2. They lack secondary cell wall.

19. Name unpaired bones of cranium.
(Gujranwala Board-New Scheme-2015-A)

Sol. 1. Frontal
2. Occipital
3. Sphenoid
4. Ethmoid

20. What is "Ball and Socket Joint"? (DGK-I-18A)
(Gujranwala. Board-New Scheme-2015-A)

Sol. Ball and Socket Joint: -

1. It is a type of joint in which a ball-shaped head of one bone fits in a socket like concavity of another.
2. It is the joint that allows the movement in several directions.
3. It has at least two pairs of muscles perpendicular to each other.
4. It provides maximum flexibility.
5. Shoulder and hip joints are examples of ball and socket joint.

21. Give classification of vertebral column.
(Gujranwala. Board-New Scheme-2016-A)

Sol. Classification of Vertebral Column: -

a. **Cervical Vertebrae** --- Vertebrae located in the neck region. Seven vertebra are found in human neck.
b. **Thoracic Vertebrae** --- Vertebrae located in the thoracic region. There are 12 thoracic vertebrae in the thoracic region.

c. Lumber Vertebrae --- Vertebrae found in the lumber region. There are five vertebrae in the human lumber region

d. Pelvic Vertebrae ---- Vertebrae found in the pelvic region. There are nine vertebrae found in the pelvic region. Pelvic vertebrae form two sets:

i. Sacrum --- It is formed by the fusion of five anterior vertebrae.

ii. Coccyx --- It is formed by the fusion of four posterior vertebrae.

22. What kind of cells are responsible for bone formation write their function?
(Gujranwala. Board-New Scheme-2017-A)

24. Kind of Cells Responsible For Bone Formation and Their Function: -

Kind of Bone Cells	Functions
1. Osteoblasts	They form bone.
2. Osteocytes	They harden the bone.
3. Osteoclasts	They dissolve the cartilage and extra bony material.

23. Why does molting takes place in arthropods?
(Gujranwala. Board-New Scheme-2017-A)

Sol. Reason:
Molting takes place in the arthropods because exoskeleton cannot grow the animal larger, hence when animal wants to grow, it sheds the exoskeleton periodically and replaces it with one of the larger size.

24. What is the difference between axial skeleton and appendicular skeleton?
(Gujranwala. Board-New Scheme-2017-A)

Sol. See Exercise Chapter No: 16 Answer No: 9 (a)

25. Define Turgor and Osmotic Pressure. (Rwp-19A)
(Multan Board (New Scheme) (2014-A)

Sol. A) Turgor Pressure: -
It is the pressure of the cell contents against the cell wall.

B) Osmotic Pressure: -

a. The potential pressure developed by a solution separated from pure water by a differentially permeable membrane.

b. It is the pressure that must be exerted on the hypertonic side of a selectively permeable membrane to prevent diffusion (by osmosis) from the side containing pure water.

c. It is also called osmotic potential.

26. Compare Exoskeleton and Endoskeleton.
(Multan Board (New Scheme) (2014-A)

Sol.

Exoskeleton	Endoskeleton
1. Exoskeleton lies outside the body of the animal.	1. Endoskeleton lies surrounded by the muscles.
2. The exoskeleton is primitive and is found usually in primitive animals i.e. mostly the invertebrates.	2. It is found in vertebrates.
3. It is inert and non-living.	3. It is composed of living tissues, which may be of two kinds cartilage and bone.
4. It is secreted by the ectodermal cells in multicellular animals.	4. It is derived from mesoderm.
5. The exoskeleton is usually very rigid and heavy and thus limits the size of an animal.	5. It does not limit the size of animal.
6. It does not allow for the growth of the animal. If such an animal has to grow, it has to cast off (molt) and re-secrete its exoskeleton periodically.	6. Endoskeleton is by no means the hindrance to the growth of animals. The internal bones can grow with the growth of the body as these bones contain living tissues.

27. What is Rigor Mortis? (DGK-I-14A, Sah-18A, Bwp-19A)
(Multan Board-New Scheme-2015-A)

Sol. Rigor Mortis: -

1. Rigor mortis is the stiffness of body that begins 3 to 4 hours after death and completes in about 12 hours.
2. After death amount of ATP in the body falls. Under these circumstances the bridges cannot be broken and so they remain firmly bound. This results in the body becoming stiff, a condition known as rigor mortis.
3. Rigor mortis gradually subsides as the proteins involved in rigor mortis begin to degrade.

28. How muscle fatigue is produced? (Bwp-16A, Sah-18A)
(Multan Board-New Scheme-2015-A)

Sol. See Exercise Chapter No: 16 Answer No: 8

29. What is Osteoporosis? Write its treatment.
(Multan Board-New Scheme-2016-A)

Sol. A) Osteoporosis: -

1. Osteoporosis is a deformity of skeleton caused by decreased estrogen level (a hormone).
2. It mostly occurs in aged women.
3. Osteoporosis is a group of disease in which reabsorption out paces bone due to which bone mass is reduced but chemical composition of the matrix remains same.
4. Other factors which may contribute include, insufficient exercise, diet poor in calcium and protein, smoking etc.

B) Treatment of Osteoporosis: -
Estrogen replacement therapy (ERT), offers the best protection against osteoporosis bone fractures.

30. Define Appendicular Skeleton.
(Multan Board-New Scheme-Group-II-2017-A)

Sol. Appendicular Skeleton: -

a. It forms a system of levers to provide mobility to the body.
b. Appendicular skeleton consists of pectoral girdle and appendages (fore limbs), and pelvic girdle and appendages (hind limbs)

31. Differentiate between Microcephaly and Osteoartheritis.
(Multan Board-New Scheme-Group-II-2017-A)

Sol.

Microcephaly	Osteoartheritis
1. It is the disease of skull. 2. In microcephaly the skull and brain inside it remains small.	1. It is the disease of joints. 2. It is a choronic degenerative disease.

32. What is the cause and symptoms of Rickets?
(Multan Board-New Scheme-Group-I-2018-A)

Sol. A) Cause of Rickets: -

It results from calcium or phosphates deficiency in the extracellular fluid, usually caused by lack of vitamin D. Children who remain indoors through the winter in general do not receive adequate quantities of vitamin D without supplementation in the diet.

B) Symptoms of Rickets: -

Symptoms of Rickets are bowed legs and deformed pelvis in children.

33. What is "All or None Response"? (Mtn-15A)
(Multan Board-New Scheme-Group-I-2018-A)

Sol. "All or None Response": -

See Bahawalpur Board Answer No: 6

The contraction of each muscle fiber is based on "All or None Response" It means:

a. Once an impulse reaches a muscle fiber, either the muscle contracts fully or it does not contract at all, there is no partial contraction for a given fiber.
b. All of the fibrils of a muscle participate in contraction.
c. All the contractions are of the same intensity. The degree of contraction depends upon the number of fibers that participate in contraction.

34. What are the characteristics of Smooth Muscles?
(Bahawalpur Board (New Marks Scheme) (2014-A)(Sgd-18A)

Sol. Characteristics of Smooth Muscles: -

a. Smooth muscles are structurally the simplest of all muscle types.
b. They consist of long, spindle shaped, uni-nucleated cells that are usually arranged in sheets that surround the body's hollow organs.
c. Smooth muscle has no striation.
d. They are involuntary that is not under the control of animal itself, instead they are automatic being controlled by autonomic nervous system.
e. They are found in the blood vessels, digestive tract, and many other organs.
f. They control the movement of substances through hollow organs.

35. Give the types of Cartilage. (Rwp-I-17A)
(Bahawalpur Board-New Marks Scheme-2015-A)

Sol. Types of Cartilage: -

There are two main types of cartilage:

A) Hyaline Cartilage:-

a. It is the most abundant type in human body.
b. It has high proportions of matrix with small amount of collagen fibers.
c. It is found at the movable joints.

B) Fibro Cartilage: -

a. It has many bundles of collagen fibers embedded in a small amount of matrix.
b. It is very flexible.
c. It forms external pinnae of ears and the epiglottis.

36. Name different bones of Hind Limb.
(Bahawalpur Board-New Marks Scheme-2016-A)

Sol. Names of Different Bones of Hind Limb: -

a. Femur b. Tibio-Fibula
c. Tarsals d. Metatarsals
e. Phalanges

37. Define Collenchyma Cells.
(Lhr-II-19A, Rwp-19A, Sah-19A)
(Bahawalpur Board-New Marks Scheme-2017-A)

Sol.

38. Describe Pelvic Girdle and Hind limb in humans skeleton. (Sah-19A)
(Bahawalpur Board-New Marks Scheme-2017-A)

Sol. A) Pelvic Girdle in Humans: -

a. Pelvic girdle attaches the hind limb to the vertebral column and supports the pelvic region.
b. It consists of two coxal bones, each of which is formed by the fusion of three bones, ilium, ischium and pubis.
c. It support the pelvic region.

B) Hind Limb in Humans: -

There are two hind limbs in humans. Each hind limb consists of:

a. One femur, the proximal bone, that forms a ball and socket joint with hip bone.
b. Tibia and fibula bone, two parallel bones which form knee joint with femur
c. Eight tarsal bones
d. Five meta tarsal bones and
e. Forteen phalanges

39. What is Cramp? Give its causes.
(Bahawalpur Board-New Pattern-2018-A)
(Fsd-18A, Grw-19A, Sah-19A)

Sol. A) Cramp: -

a. It is commonly called a muscle pull.
b. It is also known as tetanic contraction of entire muscle.
c. It causes muscle to become taught and painful.
d. It lasts for just few seconds or several hours.
e. It is most common in thigh and hip muscles.
f. It usually occurs at night or after exercise.

B) Causes of Cramp: -

It is caused due to low blood sugar level, electrolyte depletion, dehydration, and irritability of spinal cord and neurons.

40. Name bones of pelvic girdle. (DGK-II-16A) (Faisalabad Board-New Scheme-2015-A)

Sol. Names of Bones of Pelvic Girdle: -

Pelvic Girdle consists of two coxal bones. Each coxal bone is formed of three bones ilium, ischium and pubis.

41. Give hormonal causes for deformity of skeleton. (Faisalabad Board-New Scheme-2015-A)(Rwp-II-17A)

Sol. Hormonal Causes for Deformity of Skeleton: -

a. Osteoporosis is a deformity of skeleton caused by decreased estrogen level (a hormone).
b. It mostly occurs in aged women.
c. Osteoporosis is a group of disease in which reabsorption out paces bone due to which bone mass is reduced but chemical composition of the matrix remains same.
d. Estrogen replacement therapy (ERT), offers the best protection against osteoporosis bone fractures.

42. Write chemical composition of exoskeleton in Mollusca and Arthropoda. (Faisalabad Board-New Scheme-2016-A)

Sol. A) Chemical Composition of Exoskeleton in Mollusca: -

Exoskeleton of Mollusca is chemically composed of calcium carbonate.

B) Chemical Composition of Exoskeleton in Arthropoda: -

Exoskeleton in arthropod is chemically composed of chitin, waxy lipoprotein, polysaccharide and several kinds of protein.

43. Name two paired facial bones. (Faisalabad Board-New Scheme-2016-A)

Sol. Names of Two Paired Facial Bones: -

a. Maxill
b. Zygomatic

44. Write few lines about cardiac muscles. (Faisalabad Board-New Scheme-2017-A)

Sol. Few Lines About Cardiac Muscles: -

a. Cardiac muscles are muscles of heart which constitute the most of the mass of the heart walls.
b. Each heart muscle is composed of chains of single cells that are organized into fibers that are branched and interconnected.
c. Cardiac muscles contain many nuclei per cell.
d. They are irregularly striped.

45. What is the effect of exercise on muscles? (Faisalabad Board-New Scheme-2017-A)

Sol. Effects of Exercise on Muscles: -

a. Exercise increases the size and strength of skeletal muscles.
b. It makes the muscles more efficient and fatigue resistant.
c. It increases capillaries surrounding the muscle fibers.
d. It increases the numbers of mitochondria within the cells of muscle fibers.
e. It increases the amount of myoglobin in the cells of muscle fibers.

46. Define the mechanism of hydrostatic skeleton. (Faisalabad Board-New Scheme-2017-A)(Sgd-19A)

Sol. Mechanism of Hydrostatic Skeleton: -

In animals which lack a hard skeleton, a fluid filled cavity or coelom acts as a hydrostatic skeleton. It provides support and resistance to the contraction of muscles so that motality results. For example, sea anemone maintains its upright stature due to hydro skeleton. When sea anemone closes its mouth and its muscle fibers around its gastrovasular cavity filled with sea water constrict and put pressure on the liquid in the body cavity, its body maintains upright stature.

47. What is moulting? Write its stages. (Faisalabad Board-New Scheme-2018-A) (Sgd-18A, DGK-II-19A, DGK-I-18A)

Sol. A) Moulting or Ecdysis: -

Moulting or Ecdysis is the process of shedding an old exoskeleton and growing a larger one.

B) Stages of Moulting or Ecdysis: -

Moulting is divided into following four stages:

a. Enzymes, secreted from hypodermal glands, begin digesting old endo-cuticle separating hypodermis and the exoskeleton.
b. Digestion of endocuticle is followed by secretion of new procuticle and epicuticle.
c. Old exoskeleton is split and pores are formed.
d. Finally, the new exoskeleton is hardened by deposition of calcium carbonate.

48. Give role of skeleton in internal homeostasis and blood cell production. (Rawalpindi Board-New Pattern-2014-A)

Sol. A) Role of Skeleton in Internal Homeostasis: -

Bones serve as store for calcium, phosphorous, sodium, and potassium. Through negative feed back mechanisms, bones can release or take up minerals to maintain homeostasis.

B) Role of Skelton in Blood Cell Production: -

Red and white blood cells are produced in bone marrow, a connective tissue found within certain bones.

49. What are disadvantages of Exoskeleton? (Rawalpindi Board-New Pattern-2015-A) (Rwp-I-17A, Mtn-II-18, Sah-16A)

Sol. Disadvantages of Exoskeleton: -

a. It limits the ultimate size of an animal due to its weight.
b. It also limits the growth of animal. As animal outgrows, it is shed and new one is formed.
c. It leaves the arthropods temporarily vulnerable to predators.
d. With the exception of arthropods it restricts the animal's movements to the extent that animals possessing it must lead a very slow moving life or even a sessile life (corals).

50. What is cartilage? Give its types.
(Rawalpindi Board-New Course-Group-II-2017-A)

Sol. A) Cartilage: -
It is flexible connective tissue.

B) Types of Cartilage: -
There are two main types of cartilage:

i) Hyaline Cartilage:-
a. It is the most abundant type in human body.
b. It has high proportions of matrix with small amount of collagen fibers.
c. It is found at the movable joints.

ii) Fibro Cartilage: -
a. It has many bundles of collagen fibers embedded in a small amount of matrix.
b. It is very flexible.
c. It forms external pinnae of ears and the epiglottis.

51. Define remodeling
(Rawalpindi Board-New Pattern-2018-A)

52. Remodeling: -
The process in which bone gains its original form is known as Remodeling.

52. Name components of human axial skeleton.
(Sargodha Board (New Scheme) 2014-A)

Sol. Names of Components of Human Axial Skeleton: -
a. Skull b. Rib Cage
c. Vertebral Column d. Sternum

53. Define Hinge joint. Give example.
(DGK-II-19A, DGK-II-15A)
(Sargodha Board (New Scheme) 2014-A)

Sol. Hinge Joint With Example: -
a. It is a type of synovial joint.
b. It allows movement in two directions.
c. At hinge joint, pair of muscles are arranged in the same plane as that of joint. One end of each muscle, the origin, is fixed to the moveable bone on one side of the joint, and other end of muscles, the insertion, is attached to the far side of the joint.
d. Examples of hinge joints are elbow, knee and ankle joints.

54. Define turgor pressure.
(Sargodha Board-New Scheme-2016-A)

Sol. Turgor Pressure: -
a. Turgor pressure is an internal hydrostatic pressure that develops against the cell wall of a plant.
b. Turgor pressure is generated by high osmotic pressure of the cell vacuole. Tonoplast (membrane that bounds vacuole) contains a number of active transport system that pump ions into the vacuole or vacuolar compartments despite the higher concentration than that of the extracellular fluid. Because of the higher ion or solute concentration in vacuole, water enters the vacuole by osmosis, developing an internal hydrostatic pressure which presses the protoplast against the cell wall. This is called turgor pressure.
c. Turgor pressure provides turgidity, mechanical support to soft tissues of plants.
d. Turgidity plays a very important role in supporting plants and maintaining their shape and form.
e. The stems of herbaceous plants are held erect by being filled with fully turgid cells packed tightly together.
f. Turgor is also responsible for holding leaves in a flat horizontal position.

55. What are the characteristics and functions of Sclerenchyma cells?
(Sargodha Board-New Scheme-2017-A)

Sol. A) Characteristics of Sclerenchyma Cells: -
a. They have uniformly thickened secondary cell walls, usually impergenated with lignin.
b. They are non-living at maturity.

B) Functions of Sclerenchyma Cells: -
a. Their primary function is to provide support to the plant parts.
b. They also provide protection to plant parts.

56. Compare epicuticle and procuticle.
(D.G.K Board-New Course-Group-II-2014-A)(AJK-17A)

Sol. Comparison of Epicuticle and Procuticle: -

Epicuticle	Procuticle
1. It is the outer most layer of exoskeleton of arthropods. 2. It is made up of waxy lipoprotein.	1. It is the bulk of exoskeleton below epicuticle. 2. It is made up of chitin, tough, leathery, poly-saccharide and several kinds of proteins. It is also hardened by sclerotization and sometimes by impregnation with calcium carbonate.

57. What is meant by disc slip? (Mtn-II-17A)
(D.G.K Board-New Course-Group-II-2014-A)

Sol. Disc Slip:
a. Dic-slip is also known as Herneation of Disc.
b. It is the repture of annulus fibrosus followed by protrusion of the spongy nucleus pulposus.
c. If protrusion presses spinal cord and spinal nerves, it generates severe pain and even destruction of these nervous structures.
d. The discs involved in disc-slip are called herniated discs or more commonly slipped discs.
e. It occurs due to physical trauma to spines.
f. It also occurs from bending forward while lifting a heavy object.
g. It is treated with bed rest, traction and painkiller. If this fails disc may be removed surgically.

58. What is T-system?
(D.G.K Board-New Course-Group-I-2015-A)

Sol. T-system: -
a. T-system is a system of thousands of hollow, elongated transverse tubules (T-tubules) made by internal projection of sarcolemma of muscle fiber deep into the muscle cell.
b. It extends and encircles myofibril at the level of Z-line or A or I junction.
c. Transverse tubules (T-tubule) are internal extention of cell membrane that run transverse in the myofibril.
d. The T tubules, where they originate from the cell membrane, are open to the exterior. They communicate with the extracellular fluid surrounding the muscle fiber and they themselves also contain extracellular fluid in their lumen.

e. T-tubule and terminal portion of the adjacent envelope of sarcoplasmic reticulum form triads at regular interval along the length of the fibril.

f. The nerve impulse is carried through transverse tubule to the adjacent sarcoplasmic reticulum.

59. What are floating ribs?

(D.G.K Board-New Course-Group-II-2015-A)

Sol. Floating Ribs: -

The lower two pairs of ribs of rib cage (eleventh and twelfth pairs of ribs) have no anterior attachment to sternum and are referred as to Floating ribs. The cartilages of these ribs are embedded in the abdominal musculature.

60. Define Ecdysis and how it is controlled.

(D.G.K. Board-New Course-Group-II-2016-A)(DGK-I-16A)

Sol. A) Ecdysis: -

The periodic shedding of exoskeleton for growth is known as the process of Ecdysis.

B) Control of Ecdysis: -

It is controlled by the nervous system and the hormone ecdysone.

61. What are flexors? Give their examples.

(D.G.K. Board-New Course-Group-II-2017-A)

Sol. A) Flexors: -

a. Flexors are skeletal muscles whose contraction bends a joint.

b. Flexor muscles are at either or both ends to bones and move parts of the skeleton.

B) Example: -

In each human arm, biceps are flexors that bend the arm at elbow joint.

62. Name bones of human pectoral girdle.

(Sahiwal Board (New Scheme) (2014-A)

Sol. Names of Bones of Human Pelvic Girdle: -

a. Ilium ----- Two

b. Ischium -- Two

c. Pubis ----- Two

These are united to form two Coxal bones.

63. Give two adaptations in fish for swimming.

(Sahiwal Board-New Scheme-2015-A)

64. What is Tetany?

(Sahiwal Board-New Scheme-2015-A)

Sol. Tetany: -

a. It is a painful state of muscle contracture.

b. It is caused by low calcium in the blood.

c. It increases excitability of neurons and results in loss of sensation. Muscle twitches.

d. If untreated the system progresses to spasm of larynx, respiratory paralysis and ultimately death occurs.

65. Define joints and give name on the basis of structure.

(Sahiwal Board-New Scheme-2015-A)

Sol. A) Joint: -

Junction between two or more bones of the skeleton is called joint.

B) Names of Joints on the Basis of Structure: -

a. **Fibrous Joints** --- Joints where short, tough, collagenous fibers link two bones.

b. **Cartilagenous Joints** --- Joints where the articulating bones are bound together by cartilage.

c. **Synovial Joints** --- Joints where two bones are separated by a cavity containing synovial fluid.

66. Define spondylosis.

(Azad Jammuu Kasmir Board -2017-A)

Sol. Spondylosis: -

It is the disease of vertebral column which causes immobility and fusion of vertebral joints.

SECTION III

LONG QUESTIONS

3. Elaborate some major functions of the skeleton system. (Sgd-18A)

4. Write note on human appendicular skeleton. (4) (Lahore Board-New Scheme-Group-I-2016-A) (4) (Lahore Board-New Scheme-Group-II-2016-A)(Sgd-14A)

5. Give importance of skeleton. (4) (Lahore Board-New Scheme-Group-I-2017-A)

6. Describe arrangement of vertebrae in vertebral column. Also describe rib cage. (4) (Lahore Board-New Scheme-Group-I-2018-A)

7. What is sliding filament model of muscle contraction? What does it explain? (4) (Lhr-I-15A, Lhr-I-19A, Fsd-16A, Sgd-14A, Grw-15A, Rwp-16A)

9. Describe the structure of a skeletal muscle fiber. (4) (Lahore Board-New Scheme-Group-II-2018-A) (Gujranwala Board-New Scheme-2017-A) (DGK-I-18, Fsd-14A, Bwp-15A, Mtn-I-14A, Grw-14A)

11. Explain bones of human skull with diagram. (4) (Multan Board (New Scheme) (2014-A)

12. Describe Ultrastructutre of Myofilament of skeletal muscle. (4) (Multan Board-New Scheme-2015-A)

13. What are the main differences between Exoskeleton and Endoskeleton? Explain. (4) (Multan Board-New Scheme-Group-II-2017-A)

14. Describe Exoskeleton in arthropods. Write its advantages and disadvantages. (4) (Multan Board-New Scheme-Group-II-2018-A)

15. Write a note on Joints. (4) (Mtn-16A, Rwp-14A, DGK-I-14A) (Bahawalpur Board (New Scheme) (2014-A)

16. What are Growth Moments? Give its types. (4) (Bahawalpur Board-New Scheme-2016-A)

17. Describe Collenchyma and Sclerenchyma Cells in Plants. (4) (Bahawalpur Board-New Scheme-2017-A) (Rwp-15A)

18. Describe the various steps in involved in the repairing of broken bones. (4)
(Bwp-18A)
(Faisalabad Board-New Scheme-2017-A)
22. Discuss deformalities of skeleton due to genetic and hormonal causes. (4)
(Rawalpindi Board-New Pattern-2018-A)
23. Give an account of skull bones. (4)
(D.G.K. Board-New Course-Group-I-2015-A)
24. What is bone fracture? Describe repair process of simple fracture. (4)
(Rwp-18, 19A, DGK-I, II-19A)
(D.G.K. Board-New Course-Group-II-2015-A)
25. Write down the process of ecdysis in Arthropods. (4)
(D.G.K. Board-New Course-Group-I-2017-A)
27. Discuss antagonism with reference to elbow joint phenomenon. (4)
(Grw-19A)
28. What are the components of endoskeleton? Give their general characteristics. (4)
(Azad and Jammu Kashmir Board-2017-A)

Chapter ---- 17

COORDINATION AND CONTROL

1 MCQ

I) From Exercise:-

1) The neuron net of Hydra lacks:
a) Neurons b) Dendrites
c) Connection **d) Direction of impulse flow**

2) A nerve is a: (DGK-II-14)
a) Collection of neurons
b) Concentration of dendrites and axons
c) Bundle of axons or dendrites of neurons
d) Bundle of axons or dendrites bounded by connective tissue

3) Thyroid glands produce:
a) T_3, T_4 and calcitonin
b) Calcitonin
c) Tri-iodothyronine
d) Tetraiodothyronine

4) What is the number of cranial and spinal nerves in man?
a) 12 and 31 **b) 24 and 62**
c) Both a and b d) None of these

5) The one which is not related to others is: (Sah-14A)
a) Cretinism b) Myxoedema
c) Exopthalmic goiter **d) Diabetes mellitus**

II) From Punjab Boards:-

1) Excess MSH is secreted in: (Lahore Board-Old Scheme-Group-II-2014-A)
a) Addison's disease b) Parkinson's disease
c) Grave's disease d) Alzheimer's disease

2) Maximum speed of nerve impulse transmission is: (Lahore Board-New Scheme-Group-I-2014-A)(Mtn-14A)
a) 100 m/sec b) 110 m/sec
c) 120 m/sec d) 130 m/sec

3) Ethene induce flowering in: (Lahore Board-New Scheme-Group-II-2014-A)
a) Banana b) Rose
c) Pine-apple d) Orange

4) The human midbrain is: (Lahore Board-New Scheme-Group-I-2015-A)
a) Reduced b) Enlarged
c) Swollen d) Broken

5) The sensation of pain is produced by: (Lahore Board-New Scheme-Group-II-2015-A)
a) Chemoreceptors b) Mechanoreceptors
c) Photoreceptors **d) Nociceptors**

6) Microscopic gap between two neurons is called as: (Lahore Board-New Scheme-Group-I-2016-A)
a) Synapsis **b) Synapse**
c) Collapse d) Prophase

7) The onset of epilepsy usually occurs before the age of: (Lahore Board-New Scheme-Group-I-2017-A) (Sah-16A)
a) 25 years b) 50 years
c) 30 years d) 35 years

8) The part of human limbic system: (Lahore Board-New Scheme-Group-II-2018)
a) Amygdala b) Thalamus
c) Cerebrum d) Pons

9) Endocrine glands secrete: (Gujranwala Board-New Scheme-2014-A)
a) Hormones b) Salts
c) Enzymes d) Mucous

10) The cerebrospinal fluid (CSF) is similar in composition to: (Gujranwala Board-New Scheme-2015-A)
a) Blood **b) Blood plasma**
c) Blood serum d) Blood proteins

11) Lack of insulin causes: (Gujranwala Board-New Scheme-2016-A)
a) Addison disease b) Ovulation
c) Diabetes insipidus **d) Diabetes mellitus**

12) The structure of human that controls sleep-wake cycle is: (Gujranwala Board-New Scheme-2017-A)
a) Amygdala b) Hippcampus
c) Thalamus **d) Hypothalamus**

13) Glucagon cause an increase in level of blood: (Multan Board-Old Scheme-2014-A)
a) Glucose b) Sucrose
c) Lactose d) Urea

14) Nociceptors produce the sensation of: (Multan Board-New Scheme-2014-A)(Bwp-14A-19A)
a) Touch **b) Pain**
c) Warmth d) Pressure

15) --------- are indole acetic acid or its varients.
(Multan Board-New Scheme-2016-A)
a) Auxins b) Gibberellins
c) Cytokinins d) Ethene

16) Excess thyroxine produces a disease called:
(Multan Board-New Scheme-Group-I-2017-A)
a) Addison's b) Cretinism
c) Graves d) Epilepsy

17) The cytoplasmic process/fibers which carry impulse towards cell body is called:
(Multan Board-New Scheme-Group-I-2018-A)
a) Dendron b) Axons
c) Nissl's granules b) Neurofibrils

18) The plant hormone which inhibits growth and promotes seed and bud dormancy is:
(Bahawalpur Board-New Scheme-2014-A)
a) Auxin b) Cytokinins
c) Abscisic acid d) Ethene

19) The hormone which controls male secondary sexual characteristics during puberty is:
(Bahawalpur Board-New Scheme-2014-A)
a) Insuline b) Testosterone
c) Oestrogen d) Progesterone

20) Promotes closing of Stomata under conditions of water stress:
(Bahawalpur Board-New Scheme-2015-A)
a) Ethene b) Abscisic acid
c) Gibberellins d) Cytokinins

21) To cure Parkinson's disease dopamine producing cells could be grafted directly into the:
(Bahawalpur Board-New Scheme-2017-A)
a) Brain b) Liver
c) Bone Marrow d) Blood

22) Plant Growth hormone that promotes the bolting of some rosette, is the:
(Bahawalpur Board-New Scheme-2017-A)(Sah-19A)
a) Gibberellines b) Auxins
c) Cytokinins d) Ethene

23) Etiolated plants grow without:
(Bahawalpur Board-New Scheme-2018-A)
a) Water b) Light
c) O_2 d) CO_2

24) Which promotes fruit ripening?
(Faisalabad Board-Old Scheme-2014-A)(Sgd-17A)
a) Cytokinins b) Ethene
c) Abscisic acid d) Gibberellins

25) Secretin is an important hormone of:
(Faisalabad Board-Old Scheme-2014-A)
a) Pancreas b) Gut
c) Liver d) Esophagus

26) All are related to medulla oblongata, except:
(Faisalabad Board-New Scheme-2014-A)
a) Long term memory b) Breathing rate
c) Heart beat rate d) Blood pressure

27) During non-conducting state, the neuron membrane is permeable to efflux of:
(Faisalabad Board-New Scheme-2015-A)(DGK-I-17A)
a) K^+ b) Na^+
c) Ca^{++} d) Cl^-

28) The structures which respond are called:
(Faisalabad Board-New Scheme-2016-A)
a) Effectors b) Nerves
c) Receptors d) Sense organs

29) Alpha cells of pancreas secrete:
(Faisalabad Board-New Scheme-2017-A)(Mtn-II-18A)
a) Glucagon b) Insulin
c) Pancreatic juice d) Secretin

30) The corpuscles situated deep in the body and are in the form of encapsulated neurons ending, receive deep pressure stimulus are:
(Faisalabad Board-New Scheme-2018-A)
a) Meissner's b) Pacinian
c) Nissl's d) White blood cells

31) Which of the hormone suppresses ovulation?
(Rawalpindi Board–New Pattern-2015-A)(Lhr-II-19A)
a) Testosterone b) Oestrogen
c) Gastrin d) Progesterone

32) The processes conducting nerve impulses away from the cell body are called:
(Rawalpindi Board–New Pattern-2016-A)
a) Dendrites b) Dendron
c) Nissls granules d) Axon

33) Neurogleal cells provide the neuron with:
(Rawalpindi Board-New Scheme-Group-I-2017-A)
a) Protection b) Support
c) Locomotion d) Nutrition

34) The thalamus carries sensory information to the limbic system and: (Sgd-18A)
(Rawalpindi Board-New Scheme-Group-II-2017-A)
a) Cerebellum b) Cerebrum
c) Cerebral medulla d) Cerebral cortex

35) Resting membrane potential of a neuron is:
(Rawalpindi Board–New Pattern-2018-A)(Sgd-16A)
a) - 50 mV b) - 60 mV
c) - 70 mV d) - 80 mV

36) Galls are growth on a plant that are induced by:
(D.G.K Board-New Scheme-Group-I-2014-A)
a) Ticks b) Protozoans
c) Parasites d) Fungi

37) In neurons the message is transmitted across synapse in the form of chemical messenger called:
(D.G.K Board-New Scheme-Group-I-2015-A)
a) Neurotransmitters b) Communication
c) Nerve impulse d) Synaptic vesicle

38) The number of spinal nerve in man is:
(D.G.K Board-New Scheme-Group-II-2015-A)(Sgd-19A)
a) 24 b) 62
c) 12 d) 31

39) The largest part of brain is called: (Sgd-18A) (D.G.K. Board-New Scheme-Group-I-2016-A)
a) Cerebellum b) Medulla
c) Cerebrum d) Thalamus

40) Alzheimer's disease is characterized by the decline in the function of: (D.G.K. Board-New Scheme-Group-II-2016-A)
a) Brain b) Liver
c) Kidney d) Stomach

41) A pair of adrenal gland is present on the top of each: (D.G.K. Board-New Scheme-Group-II-2017-A)
a) Ear **b) Kidney**
c) Eye d) Testis

42) Excess of which hormone causes Addison's disease? (D.G.K. Board-New Scheme-Group-II-2018-A)
a) FSH **b) MSH**
c) LTH d) TSH

43) Apical dominance is caused by: (Sahiwal Board-New Scheme-2014-A)
a) Gibberellins b) Cytokinins
c) Ethene **d) Auxins**

44) In mylelinated neurons, the impulse jumps from node to node and is called: (Sahiwal Board-New Scheme-2015-A)
a) Saltatory impulse b) Nerve impulse
c) Synapse d) Synapsis

45) Which hormone in male stimulates the production of testerone? (Sahiwal Board-New Scheme-2018-A)
a) TSH b) FSH
c) LTH **d) ICSH**

46) Meissner's corpuscles are specialized for the stimulus of: (Azad Jammu Kashmir Board-2017-A)
a) Pain **b) Touch**
c) Vibration d) Chemicals

III) From Entry Test:-

1) Which of the following receptors produce sensation of pain? (Entry Test-2007)
a) Mechanoreceptors c) Chemoreceptors
b) Nociceptors d) Thermoreceptors

2) When your finger accidentally gets caught in a door, pain message is sent to your brain through: ----------: (Entry Test-2007)
a) Homeostasis c) Caffein
b) Sensory receptors d) Medulla

3) Which of the following promotes leaf and fruit growths? (Entry Test-2007)
a) Auxins c) Abscisic acid
b) Gibberellins d) Ethane

4) Which of the following controls several automatic functions like breathing, heart rate, and blood pressure? (Entry Test-2007-2012)
a) Midbrain **c) Medulla**
b) Pons c) Cerebellum

5) This disease is characterized by decline in brain function: (Entry Test-2007)
a) Alzheimer's disease c) Epilepsy
b) Parkinson's disease d) None of these

6) Which hormone continues to promote protein synthesis throughout the body even after the cease in growth? (Entry Test-2007)
a) TSH c) ACTH
b) ADH **d) STH**

7) The part of neuron fiber which conducts nerve impulse away from the cell body is: (Entry Test-2012)
a) Dendron **c) Axon**
b) Dendrites d) Peripheral branch

8) Cause of Parkinson's disease is death of brain cells that produce: (Entry Test-2012)
a) Dopamine c) ADH hormone
b) Accetylcholine d) Oxytocin

9) The number of cranial nerves in humans is: (Entry Test-2012)
a) 21 pairs c) 24 pairs
b) 12 pairs d) 62 pairs

10) Ductless glands are known as: (Entry Test-2012)
a) Endocrine glands c) Salivary glands
b) Exocrine glands d) Site glands

11) Gastrin is the hormone which is produced by the: (Entry Test-2012)
a) Liver **c) Pyloric region of stomach**
b) Adrenal gland d) Mucosal lining of intestine

12) β cells of pancreas secrete a hormone that is called: (Entry Test-2012-2015-2016)
a) Insulin c) Antidiuretic hormone
b) Glucagon d) Gastrin

13) Vasopressin and Oxytocin are released from the: (Entry Test-2012)
a) Placenta c) Anterior pituitary
b) Ovaries **d) Posterior pituitary**

14) Which of the following is a hormone? (Self-Test Questions-2013)
a) Gastric juice **c) Bile**
b) Pancreatic **d) Insulin**

15) The hormones in the human body are produced by: (Self-Test Questions-2013)
a) Brain only c) Pancreas only
b) Liver only **d) Different endocrine glands**

16) Insulin is a hormone produced by: (Self-Test Questions-2013)
a) Thyroid gland c) Adrenal gland
b) Parathyroid **d) Pancreas**

17) The hormone called Parathormone regulates calcium level in the blood. This hormone is produced by: (Self-Test Questions-2013)
a) Gonads c) Thyroid gland
b) Gut **d) Parathyroid**

18) Mechanoreceptors detect stimulus of: (Self-Test Questions-2013)
a) Smell **c) Pressure (touch)**
b) Light d) Cold and warmth

19) The effectors in the human body which respond to a stimulus are: (Self-Test Questions-2013)
a) Glands only **c) Both muscles and glands**
b) Muisles only d) Bones

20) Loss of memory (Dimentia) is also known as: (Self-Test Questions-2013-2015)
a) Alzheimer's disease c) Parkinson's disease
b) Epilepsy d) Graves disease

21) A mix nerve consists of: (Self-Test Questions-2013)
a) Motor and sensory nerve fibers
b) Sensory and associative nerve fibers
c) Motor and associative nerve fibers
d) Dendrons and dendrites

22) The structures which respond when they are stimulated by impulse coming through motor neuron are: (Entry Test-2013)
a) Receptos b) Transducers
b) Responders **d) Effectors**

23) Thalamus and cerebrum are the part of: (Entry Test-2013)
a) Fore brain c) Hind brain
b) Mid brain d) Spinal cord

24) There is also evidence that high levels of -------- may contribute to the onset Alzheimer's disease: (Entry Test-2013)
a) Mg **c) Al**
b) Mo d) Ca

25) L-dopa or Levadopa is used to get some relief from: (Entry Test-2013)
a) Epilepsy **c) Parkinson's disease**
b) Alzheimer's disease d) Dementia

26) Chemically insulin and glucagon are: (Entry Test-2013)
a) Carbohydrates c) Lipids
b) Proteins d) Nucleic acid

27) Hormones secreted by anterior pituitary and which controls the secretion of hormones of other glands are known as: (Entry Test-2013)
a) Release factor
b) Inhibitor
c) Accelerator
d) Tropic or trophic hormones

28) Alpha cells of Islets of Langerhans secrete hormone called: (Entry Test-2013)
a) Glucocorticoid **c) Glucagon**
b) Insulin d) Aldosterone

29) Which of the following is the function of glucagon hormone? (Entry Test-2013)
a) Glucose to lipids c) Glucose to glycogen
b) Glucose to protein **d) Glycogen to glucose**

30) The right and left cerebral hemispheres are connected by a thick band of nerve fibers called: (Entry Test-2014)
a) Medulla c) Pons
b) Corpus callosum d) Hippocampus

31) The part of the brain which guides smooth and accurate motions and maintains body position is called: (Entry Test-2014-2016)
a) Cerebrum c) Pons
b) Cerebellum d) Medulla

32) Which one of the following is the effect of sympathetic nervous system? (Entry Test-2014)
a) Constriction of bronchi
b) Decrease in heart rate
c) Promotes digestion or peristalsis
d) Dilates the pupil

33) High level of aluminium may contribute to the onset of which one of the following? (Entry Test-2014-2017)
a) Parkinson's disease **c) Alzheimer's disease**
b) Epilepsy d) Gonorrhea

34) Which of the following is asteroid hormone? (Entry Test-2014)
a) Glucagon c) Epinephrine
b) Thyroxine **d) Oestrogen**

35) The gonadotophic hormones of anterior lobe of pituitary include: (Entry Test-2014)
a) Prolactin, Thyroid Stimulating Hormone, Somatotropin Hormone
b) Follicle Stimulating Hormone, Leutinizing Hormone, Prolactin
c) Adrenocorticotrphic Hormone, Lutenizing Hormone, Follicle Stimulating Hormone
d) Lutinizing Hormone, Follicle Stimulating Hormone, Thyroid Stimulating Hormone

36) Over-activity of cortical hormone of adrenal gland causes: (Entry Test-2014)
a) Addison's disease **c) Chushing's disease**
b) Parkinson's disease d) Downs syndrome

37) How many iodine atoms are present in thyroxine? (Entry Test-2014)
a) 3 c) 2
b) 4 d) 5

38) Neurotransmitter secreted at synapse outside the central nervous system is: (Entry Test-2015)
a) Dopamine c) Androgen
b) Polypeptide **d) Acetylcholine**

39) Conduction of action potentials from one node Ranvier to another in myelinated neuron is through: (Entry Test-2015)
a) Hyperpolarization
b) Resting membrane potential
c) Depolarization
d) Saltatory conduction

40) In the following diagram of action potential in a neuron 'x' depicts: (Entry Test-2015)
a) Depolarization c) Repolarization
b) Polarization d) Hyperpolarization

41) Thyroxine deficiency in in adults' results in a condition called: (Entry Test-2015)
a) Critinism c) Thyrotoximia
b) Hypothyroidism **d) Myxoedema**

42) α cells of pancreas secrete a hormone known as: (Entry Test-2015)
a) Glucagon c) Gatrin
b) Insulin d) Rennin

43) Random, uncontrolled activity of some cells in the brain leading to chaotic activity in both sensory and motor nerves causes patients of ---------- to see and hear different strange things:(Entry Test-2016)
a) Epilepsy c) Alzheimer's Disease
b) Parkinson's Disease d) Huntington's Disease

44) Events of menustral cycle are regulated by the: (Entry Test-2016)
a) Ethylene c) Auxins
b) Gonadotrophins d) Gibberellins

45) --------- hormone is antagonist to insulin and causes increase in blood glucose level: (Entry Test-2016)
a) Glucagon c) Calcitonin
b) Nor-epinephrine d) Thyroxine

46) The central portion of adrenal gland (Adrenal Medulla) produces ---------- hormone. (Entry Test-2016)
a) Aldosterone c) Androgen
b) Epinephrine d) Corticosterone

47) ---------- hormones are called fight and flight hormones as they prepare an organism to face stressful situation: (Entry Test-2016)
a) Adrenaline, Aldosterone
b) Epinephrine, Nor-epinephrine
c) Cortisone, Oxytocin
d) Thyroxine, Nor-epinephrine

48) Humans have homeostatic thromostat present in a specified portion of the brain that is: (Entry Test-2016)
a) Lateral ventricle c) Spinal cord
b) Thalamus **d) Hypothalamus**

49) The disease in which death of small number of cells in the basal ganglia leads to inability to select and initiate patterns of movement is known as: (Entry Test-2016)
a) Fever c) Epilepsy
b) Alzheimer's Disease **d) Parkinson's disease**

50) A neurological disorder characterized by the decline in brain function is ----------. Its symptoms are similar to those disease that cause dementia: (Entry Test-2016)
a) Parkinos's Disease **c) Alzheimer's Disease**
b) Epilepsy d) Diabetes

51) A discharge by brain which causes chaotic activity in motor and sensory area is: (Entry Test-2016)
a) Meningitis **c) Epilepsy**
b) Alzheimer's Disease d) Parkinson's Disease

52) The nerve impulse which jumps from node to node in myelinated neurons is called as: (Entry Test-2017)
a) Resting membrane potential
b) Saltatory nerve impulse
c) Threshold stimulus
d) Initial nerve impulse

53) The CNS is protected by: (Entry Test-2017)
a) Three layers of meninges
b) One layer of moninx
c) 4 layers of meninges
d) 2 layers of maninges

54) White matters of spinal cord is made up of: (Entry Test-2017)
a) Sensory nerve fibers c) Motor nerve fibers
b) Myelinated nerve fibers d) Mixed nerve fibers

55) The thyroxine hormones of thyroid glands act directly on: (Entry Test-2017)
a) Iodine metabolism **c) Glucose metabolism**
b) Protein metabolism **d) Basal metabolic rate**

56) All the hormones released by anterior pituitary are tropic hormones except: (Entry Test-2017)
a) TSH c) ACTH
b) STH d) Gonadotrophin hormone

57) W.O.F is endocrine as well as exocrine: (Entry Test-2017)
a) Liver c) Thyroid
b) Adrenals **d) Pancreas**

58) Ovulation is suppressed by progesterone via: (Entry Test-2017)
a) Only by inhibition of LH
b) Inhibition of FSH and stimulation of LH
c) Inhibition of LH and stimulation of FSH
d) Inhibition of both FSH and LH

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. Define circadian rhthym.

Sol. Circadian Rhthym: -

1. Biorhythym which shows periodicity of about 24-hours is called Cricadian Rhthym.
2. It is also called diurnal rhythm.
3. It is in one's genes but the environment influences the rhthyms to some extent.
4. Circadian rhthyms are controlled by an internal timing mechanism called a biological clock.
5. Basic period of clock is innate. Ervin bunning has shown that exposure of fruitfly (*Drosophila*) to constant conditions for 15 consective generations fails to eliminate the essential 24 hour rhthym of this insect.

2. What is the difference between CNS and PNS?

Sol.

CNS	PNS
1. CNS consists of a complex brain that is continuous with the dorsal tubular spinal cord. 2. It is located in the centre of the body. 3. It receives and processes incoming informations and determine appropriate responses.	1. PNS consists of the sensory receptors, the nerves that link these receptors with the CNS and the nerves that link the CNS with effectors (muscles and glands) 2. It is located in the peripheral regions of the body. 3. It transmits signals between CNS and rest of the body.

3. What are the functions of parathyroid gland?

Sol. Functions of Parathyroid Gland: -

Parathyroid gland, through its hormone, parathormone (PTH), regulates blood calcium level by one of the following way:

a. It raises plasma calcium by withdrawing calcium from the bone.
b. It increases calcium reabsorption from the kidney tubules.
c. It increases intestinal absorption of calcium.

4. Define the term hormone.

Sol. Hormone:

1. Hormones are organic compounds that are produced by endocrine (ductless) glands and are poured directly and are transported to blood to respective target tissues.
2. Hormones affect the target cells.
3. They do not initiate new biochemical reactions but produce their effects by regulating enzymatic and other chemical reactions, already present.
3. They may either stimulate or inhibit a function.
4. Hormones may also control some long term changes, such as rate of growth, rate of metabolic activity and sexual maturity.
5. Hormones are composed of amino acids, small polypeptides, protein, or steroid.

5. What are the commercial applications auxins?

Sol. Commercial Applications of Auxins: -

1. Synthetic auxins, NAA (Naphthalene acitic acid) and Indole propionic acid, simulate natural fruit set and sometimes induce parthenocarpy (fruit setting in the absence of pollination).
2. 2,4 D (2, 4 Dichlorophenoxy acitic acid), a synthetic auxin, acts as selective weed killer and is used in lawns and cerial crops to eliminate broad leaved dicot weeds.
3. 2,4 D is used to inhibit sprouting of potatoes.
4. 2,4 D is also used to retard abscission (premature fruit drop).

6. List different types of tropisms.

Sol. Different Types of Tropisms: -

a. **Gravitropism** --- The response of a plant to gravity
b. **Phototropism** ---- Directional growth of plant parts caused by light
c. **Thigmotropism** --- Unequal growth in response to a mechanical stimulus such as contact with a solid object
d. **Chemotropism** --- Movement in response to some chemicals
e. **Hydrotropism** ---The movement of plant parts in response to stimulus of water

7. Write a note on Alzheimer's disease.

Sol. Alzheimer's Disease: -

1. Alzheimer's disease was first described by Alois Alzheimer in 1907.
2. It is characterized by the decline in brain function.
3. Its symptoms are similar to those diseases that cause dementia (memory loss).
4. There is genetic predisposition to the disease in some people, so it tends to run in families.
5. There is also evidence that high level of aluminium may contribute to the onset of disease.

II) From Punjab Boards:-

1. Differentiate between biorhthyms and diurnal rhthyms.

(Lahore Board-New Scheme-Group -I-2014-A)

Sol.

Biorhythms	Diurnal Rhythms
These are behavioral activities that show the periodicity of about 24 hours or 365 days.	They have periods of about a day or 24 hour.

2. Give role of 1, 2 dichlorophenoxy acetic acid.

(Lahore Board-New Scheme-Group -I-2014-A)

Sol. Role of 1, 2 Dichlorophenoxy Acetic Acid:

a. It is a broad leaves (dicot) weed killer used in cereal crops and lawns to eliminate weeds.
b. It inhibits sprouting of potatoes.
c. It retards abcession or premature fruit drop.

3. Write functions of photoreceptors and nociceptors.

(Lahore Board-New Scheme-Group -I-2014-A)

Sol. A) Functions of Photoreceptors: -

Photoreceptors (rod and cone cells of retina) respond to stimuli of light and transform the light energy into electrical signals for transmission to the CNS.

B) Nociceptors: -

Nociceptors detect tissue damage and produce sensation of pain.

4. What is Reflex arc? (Lhr-I-15A, DGK-I,II-18A) (Lahore Board-New Scheme-Group-II-2014-A)

Sol. Reflex Arc:

1. Reflex arc is the pathway of immediate and automatic involuntary responses called reflex actions.
2. Reflex arc typically includes five basic components:

a. Receptor
b. Afferent pathway (sensory neurons)
c. Integrating centre (CNS)
d. Efferent pathway (motor neurons)
e. Effector (muscle or gland)

3. In reflex arc, the pathway of nerve impulse is from receptor to sensory neuron to associative neuron and then through motor neurons to the effectors.

Example: -

The knee-jerk reflex arc involves only two neuron, a sensory and the other motor neuron whose soma lie in the spinal cord.

5. Give two commercial applications of Gibberellins. (Lahore Board-New Scheme-Group-II-2014-A)(Lhr-I-18)

Sol. See Lahore Board Answer No: 22

6. How Axons differ from Dendron? (Lahore Board-New Scheme-Group-II-2014-A)(Grw-14A)

Sol. Axon Different from Dendron: -

Axon	Dendron
1. Axon is a long cytoplasmic process which conducts nerve impulse away from the cell body or soma. 2. It is found in sensory, motor and associative neurons.	1. It is single fiber of neuron which conducts nerve impulse towards the cell body. 2. It is found only in sensory neurons.

7. What is the role of antidiuretic hormone? (Lahore Board-New Scheme-Group-I-2015-A)

Sol. Role of Antidiuretic Hormone: -

It causes increased water reabsorption in distal parts of nephron. It acts to actively transport water from filtrate in collecting tubules back to kidney.

8. What is saltatory impulse? (DGK-II-16) (Lahore Board-New Scheme-Group-II-2015-A)

Sol. Saltatory Impulse: -

a. Saltatory impulse is a nerve impulse that occurs in myelinate neurons which jumps from node to node (node of Ranvier), skipping over the myelinated sections of the axon.
b. In saltatory impulse, action potentials occur only at nodes, and are conducted from node to node. So saltatory impulse jumps from node to node skipping over the myelinated sections of the axon.
c. Its velocity is 5 to 50 fold faster than nerve impulse.

9. What is action of nicotine on coordination? (Lahore Board-New Scheme-Group-II-2015-A)(Rwp-I-17A)

Sol. Action of Nicotine on Coordination: -

a. Nicotine is a drug that can also stimulate postsynaptic membrane in CNS and PNS in the same manner as acetylcholine because the membranes of these neurons all contain nicotine type of acetylcholine receptors.
b. It increases the heartbeat rate and blood pressure as well as digestive tract mobility. Nicotine may even occasionally induce vomiting and/or diarrhea.
c. It also causes water retention by the kidneys.

10. What is cretinism? (Lahore Board-New Scheme-Group-II-2015-A)

Sol. Cretinism: -

a. Critinism is caused by hypothyroidism (lack of thyroxine) in early age, usually congenitally.
b. Individuals with critinism are small, have coarse scanty hair, thick yellowish scaly skin and are mentally retarted and sexually immature.

11. Give role of hypothalamus as endocrine gland. (Lahore Board-New Scheme-Group-I-2016-A)

Sol. Role of Hypothalamus as Endocrine Gland: -

Hypothalamus performs two types of roles as endocrine gland given below;

a. One of the nerve clusters in the hypothalamus synthesizes oxytocin and vasopressin (ADH), then stores them in nerve endings located in the posterior pituitary. Upon proper stimulation from the brain, oxytocin and vasopressin are released into the blood supply of pituitary.
b. Other nerve clusters in the hypothalamus produce and secrete a variety of releasing and inhibitng hormones, which are carried by the blood to the anterior pituitary. There they regulate secretion of various tropic hormones, growth hormone, and prolactin manufactured by the anterior pituitary cells.

12. Draw and label sensory neuron. (Rwp-16A) (Lahore Board-New Scheme-Group-I-2016-A)

Sol.

13. Name only types of innate behavior. (DGK-II-15A) (Lahore Board-New Scheme-Group-I-2016-A)

Sol. Names of Types of Innate Behavior: -

1. **Orientation –** It has following two types:

a. Kineses
b. Taxes

2. **Reflexes and Instincts** --- These include:

a. Biological rhythms
b. Territorial Behavior
c. Courtship
d. Mating
e. Aggression
f. Altrusim
g. Social Heirarchies
h. Social Organizations

14. Define diurnal rhythms. How they are different from circannual rhythms? (Bwp-15A, Sah-18A, DGK-I-19A) (Lahore Board-New Scheme-Group-II-2016-A)

Sol. A) Diurnal Rhythms: -

Biorhythyms which show periodicity of about 24-hours are called DiurnalRhthyms.

B) Dirunal Rhythms Different From Circannual Rhythms: -

Diurnal Rhythms	Circannual Rhythms
These are the biorhythms which have periods of about a day.	These are the biorhythms which have periods of about a year.

15. Write commercial application of cytokinins.
(Rwp-19A, Mtn-II-16A, DGK-I-14)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Commercial Application of Cytokinins: -

a. Cytokinins delay aging of fresh leaf crops (delay of senescence) such as cabbage and lettuce.
b. They keep flowers fresh.
c. They can also be used to break dormancy of some seeds.

16. What are effectors? Give their types.
(Grw-14A, Mtn-II-18A, Fsd-18A, Sgd-16A, DGK-II-19A, Grw-19A)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. A) Effectors: -
Effectors are the structures which respond when they are stimulated by impulse coming via motor neuron.

B) Types of Effectors: -

a. Glands ---- They respond by secreting.
b. Muscle ----They respond by contracting.

17. How plants respond to various stimuli? (Lhr-I-19A)
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Respond of Plant to Various Stimuli: -

a. Plants respond to short supply or absence of light by becoming extremely long and failing to form chlorophyll, the condition is called etiolation.
b. Plants respond to short supply of mineral nutrients in the soil by failing to form sufficient chlorophyll and taking on yellowish hue, the condition is called chlorosis.

18. Give commercial applications of auxins. (DGK-II-16)
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. See Exercise Chapter No: 17 Answer No: 5

19. Define feed back mechanism.
(Rwp-14A, DGK-I, 15, 17A, Bwp-19A)
(Lahore Board-New Scheme-Group-I-2018-A)

Sol. Feedback Mechanism: -

1. It is a type of mechanism in which controlling mechanism is itself controlled by the products of reactions it is controlling.
2. It is the detection of change and signaling for the effector's response to control system.
3. In human body many feedback mechanisms are operating for maintaining the products in the body into certain limits.. If there are accelators there must be inhibitors. Body temperature as well as hormonal secretions are regulated by feedback mechanism.
4. It has been observed that there could be negative as well as positive feed backs.
5. An example of negative feedback in hormonal system is as follows:

a. Low body temperature or stress stimulates neurosecretory cells of the hypothalamus to release TRF which acts on anterior pituitary to release TSH.
b. TSH stimulates the thyroid gland to secrete thyroxine.
c. Thyroxine causes an increase the metabolic activity of most body cells, generating ATP energy and heat.
d. Both raised body temperature and higher thyroxine levels in the blood inhibit the releasing hormone cells and the TSH-producing cells.

20. Differentiate between reflex action and reflex arc.
(Lahore Board-New Scheme-Group-I-2018-A)(Sgd-19, Mtn-I-17)

Sol.

Reflex Action	Reflex Arc
It is an automatic, involuntary action which occurs due to external and internal stimuli.	It is the pathway of passage of nerve impulse during a reflex action.

21. What is Parkinson's disease?
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. Parkinson's Disease: -

a. It is a nervous disorder, characterized by involuntary muscular tremors at rest such as involuntary shaking of the hands or head., diminished motor power and rigidity.
b. In Parkinso's disease mental faculties are not affected.
c. It is caused by cell death in a brain area that produces dopamine. The disease may result by head trauma.
d. Onset of disease is usually in 50's and 60's. It progresses slowly and the patient may live for many years.
e. It is treated with L-dopa (an acronym for dihydroxyphenylalanine), a precursor from which dopame can be produced.
f. A naturally occurring protein called glial cell-line derived neutrophic factor (GDNF) may be used in near future for humans in the treatment of Parkinson.

22. Differentiate between active and resting membrane potential. (Fsd-17A, DGK-II-15A, Rwp-18A)
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. Differences Between Active and Resting Membrane Potential: -

Resting Memebrane Potential	Active Memebrane Potential
1. It is the electric potential that exists across the cell membrane of nerve cell when it is non-conducting nerve impulse. 2. In resting membrane potential, the outer membrane surface is more positive than inside. 3. In resting membrane potential, the neuron has a membrane potential of approximately -70mV.	1. It is the electric potential that exists across the part of cell membrane of nerve cell when it is conducting nerve impulse. 2. In active membrane potential, the inner membrane surface is more positive than outside. 3. In action membrane potential, the neuron has a membrane potential of +50mV.

23. Differentiate between nerve impulse and saltatory impulse. (Gujranwala Board (New Scheme) (2014-A)

Sol.

Nerve Impulse	Saltatory Impulse
1. It occrs in unmyelinated fibers. 2. In ordinary nerve impulse, action potentials are generated within every section of an unmyelinated axonal membrane from beginning to end. 3. It travels slowly at the speed of about 1 to 10 meter per second.	1. It occurs in myelinated fibers. 2. In saltatory impulse, action potentials occur only at nodes, and are conducted from node to node. So saltatory impulse jumps from node to node skipping over the myelinated sections of the axon. 3. Its velocity is 5 to 50 fold faster than nerve impulse.

24. What are neurotransmitters?
(Sah-14, 17A, DGK-I-17, Fsd-14A, 16A, Mtn, 14,15A,II-17, I-18, Rwp-15A)
(Gujranwala Board (New Scheme) (2014-A)

Sol. Neurotransmitters: -

a. Neurotransmitter is a chemical that is released by a nerve cell close to a second nerve cell, a muscle, or a gland cell and that influences the activity of the second cell.
b. These are present in the CNS and PNS.
c. Many different types of neurotransmitters (more than 60) are known. These are acetylcholine, adrenaline, nor-epinephrine, serotonin and dopamine.
d. Acetylcholine is the main neurotransmitter for synapses that lie outside the central nervous system. Others are mostly involved in synaptic transmission within the brain and spinal cord.

25. What are commercial applications of ethane? Quote any two. (Gujranwala Board-New Scheme-2015-A) (Sah-19A, Mtn-II-17A, Fsd-15A, Sgd-14A, Grw-19A)

Sol. Two Commercial Applications of Ethene: -

a. It induces flowering in pineapple.
b. It stimulates ripening of tomatoes and citrus fruit.

26. Differentiate between axons and dendrites.
(Gujranwala Board-New Scheme-2015-A)

Sol.

Axons	Dendrites
1. Axons are long, un-branched, single cytoplasmic process (fiber) of neurons. 2. They conduct nerve impulse away from the cell body or soma. 3. They are specialized for conducting impulses to other neurons or effectors. 4. Axons are usually covered by a myelin sheath.	1. Dendrites are typically, short, numerous, highly branched cytoplasmic processes (fibers) of neurons. 2. They conduct nerve impulse towards the cell body or soma. 3. They are specialized to receive stimuli and send signals to the cell body. 4. They are not covered by myelin sheath.

27. What is meant by division of labour?
(Gujranwala Board-New Scheme-2015-A)

Sol. Division of Labour: -

It is the specific arrangement of organelles/cells/ organs to perform specific functions.

28. What is the role of insulin?
(Gujranwala Board-New Scheme-2016-A)

Sol. Role of Insulin: -

a. It increases glycogen synthesis.
b. It increases cell utilization of glucose.
c. It stimulates conversion of glucose into lipid and protein.
d. It inhibits the hydrolysis of glycogen in the liver and muscle.

29. Write a note on Alzheimer's disease.
(Gujranwala Board-New Scheme-2016-A)

Sol. A Note on Alzheimer's Disease: -

1. Alzheimer's disease was first described by Alois Alzheimer in 1907.
2. It is characterized by the decline in brain function.
3. Its symptoms are similar to those diseases that cause dementia (memory loss).
4. There is genetic predisposition to the disease in some people, so it tends to run in families.
5. There is also evidence that high level of aluminium may contribute to the onset of disease.

30. Differentiate between kinesis and taxes.
(Gujranwala Board-New Scheme-2016-A)
(Mtn-14A, Bwp-18A, 19A)

Sol. Differences Between Kinesis and Taxes: -

Kineses Behavior	Taxes Behavior
1. In kinesis intensity of the stimulus rather than its direction governs the response of the animal. 2. Response is also non-directional. Stimulus changes the rate of activity not direction of the movement such as speed of the random movement or frequency of turning or both. **Examples:** 1. Wood-lice move about quickly in dry conditions but slow down and stop in humid area. 2. Salters respond to low humidity by slowing their rate of movement and their rate of turning.	1. In taxes direction of the stimulus governs the response of the animal. 2. Response is also directional, i.e. movement of the animal, either towards or away from the stimulus. **Examples:** 1. Daphnia (water flea) shows positive phototaxis, moving towards light. 2. Male silkworm show positive chemotaxis, moving towards pheromone secreted by male. 3. Earthworms, centipedes, and slaters show negative phototaxis, moving away from light.

31. Enlist the hormones secreted by posterior lobe of pituitary gland. (Bwp-16A)
(Gujranwala Board-New Scheme-2017-A)

Sol. List of the Hormones Secreted by Posterior Lobe of Pituitary Gland: -

a Antidiuretic Hormone (ADH) or Vasopressin --- Absorbs water actively from collecting tubules of nephrons
b. Oxytocin --- Induces labor pain and causes milk ejection from mammary glands

32. Compare sympathetic with parasympathetic nervous system. (Gujranwala Board-New Scheme-2017-A) (Bwp-14A, DGK-II-15A)

Sol. Comparison of Sympathetic With Parasympathetic Nervous System: -

Sympathetic System	Parasympathetic System
1. Nerves arising from the middle portion of spinal cord form the sympathetic nervous system.	1. A few cranial nerves including vagus nerve together with the nerves from the bottom portion of spinal cord, form the parasympathetic nervous system.
2. Fibers of the this system almost terminate in ganglia that lie near the cord.	2. Fibers of this system terminate in ganglia that lie near or within the organ.
3. It prepares the body for highly energetic activities such as fight or flight.	3. It promotes all the internal responses that are associated with relaxed state.
4. It accelerates the heart beat, increases the breathing rate, dilates the pupil, inhibits the digestion of food etc.	4. It slows heart beat, decreases the breathing rate, constricts the pupil, promotes the digestion of food etc.

33. Define biorhythms and give their types. (Mtn-16A, Rwp-15A, II-17A) (Gujranwala Board-New Scheme-2017-A)

Sol. A) Biorhythms: -

1. Biorhthyms or biological rhthyms are behavioral activities that occur at regular intervals.
3. Many organisms maintain internal rhthym or clock to predict the onset of the periodic changes such as days, tides, and seasons and keep them prepared for these changes. The basic period of clock is innate.
4. Biorhthyms may be exogenous, or endogenous or combination of both.
5. Biorhthyms are in organisms gene but the environement influences these rhthyms to some extent.

B) Types of Biorthyms: -

There are following two types of biorhyms:

a. Circadians --- Showing periodicity of 24 hours

b. Circannuals --- Showing periodicity of 365 days

34. Give any two characteristics of hormones. (Gujranwala Board-New Scheme-2018-A)

Sol. Two Characteristics of Hormones: -

a. They may either stimulate or inhibit a function.
b. Hormones may also control some long term changes, such as rate of growth, rate of metabolic activity and sexual maturity.

35. What is neuroglia? Give its role. (Mtn-15A, Sah-14A, Bwp-14A) (Gujranwala Board-New Scheme-2018-A)

Sol. Neuroglia and Its Role: -

In higher animals and in humans, neuroglia or glial cells are cells other than neurons which make up as much as half of the nervous system.

36. Define Apical Dominance. (Multan Board (New Scheme) 2014-A)

Sol. Apical Dominance: -

a. Apical dominance is the inhibition of lateral buds by terminal bud at shoot tip.
b. In some plants only terminal or apical bud grows while their lateral buds donot develop as long as the terminal bud is present. Such plants are said to have apical dominance.
c. Plants with apical dominance produce auxin that inhibits lateral buds near the apical meristem from developing into actively growing shoots.
d. Removal of terminal buds releases the lateral bud from apical dominance because the source of auxin is removed and the lateral buds grow to form branches.
e. If cytokinin is applied directly on the inhibited lateral buds, they are also released from apical dominace and develop into lateral branches.

37. What are Picinian Corpuscles? (Multan Board-New Scheme-2015-A)

Sol. Picinian Corpuscles: -

a. They are encapsulated.
b. They are situated quite deep in the body.
c. They are also located in the limbs.
d. They receive deep pressure stimuli. They probably form a basis for vibration sense.

38. What is the role of Cytokinins? (Multan Board-New Scheme-Group-I-2017-A)

Sol. Role of Cytokinins: -

a. They promote stem growth by cell division in apical meristem and cambium.
b. They inhibit primary root growth.
c. They promote lateral root growth.
d. They promote bud initiation and leaf growth.
e. They promote lateral bud growth.
f. They break lateral bud dormancy.
g. They promote stomatal opening.

39. What is the role Hind-brain? (Multan Board-New Scheme-Group-I-2017-A)

Sol. Role of Hind-Brain: -

a. Hind-brain (through medulla) controls several automatic functions, such as breathing, heart rate, blood pressure and swallowing.
b. It also guides (through cerebellum) smooth and accurate motions and maintain body position.
c. It is involved in learning and memory storage for behaviors.
d. It (through pones) influences transition between sleep and wakefulness, and the rate and patterns of breathing.

40. Define Nissl's granules. (Rwp-II-17A) (Multan Board-New Scheme-Group-I-2018-A)

Sol. Nissl's Granules: -

a. Nissel's granules are groups of ribosomes associated with RER and Golgi apparatus.
b. They are present in the cell body.

41. What are two functions of Parathyroid gland?
(Multan Board-New Scheme-Group-I-2018-A)

Sol. Two Functions of Parathyroid Gland: -

a. Parathyroid gland, through its hormone, parathormone stimulates the release of calcium from bones.
b. It increases calcium reabsorption from the kidney tubules.

42. Differentiate between Chemoreceptors and Mechanoreceptors. (Sgd-14A)
(Multan Board-New Scheme-Group-II-2018-A)

Sol. Differences Between Chemoreceptors and Mechanoreceptors: -

Chemoreceptors	Mechanoreceptors
Chemoreceptors detect chemicals dissolved in fluid medium surrounding them.	Mechanoreceptors detect stimuli of touch, pressure, hearing and equilibrium.

43. What is Epilepsy? Write name of important test in the study of Epilepsy. (DGK-I-14A)
(Multan Board-New Scheme-Group-II-2018-A)

Sol. A) Epilepsy: -

a. Epilepsy is one of the convulsive disorders of nerves which are characterized by abrupt transient symptoms of motor, sensory, psychic or autonomic nature, frequently associated with changes in consciousness. The changes are believed to be secondary to sudden transient alterations in brain function associated with excessive rapid electrical discharges in gray matter.
b. The onset of epilepsy is usually before age of 30. Later age onset suggests organic disease.
c. In some patients emotional disturbances play a significant trigger role. Alcohol aggravates epilepsy.

B) Name of Important Test in the Study of Epilepsy: -
Electroencephalography

44. Give application of Synthetic Auxins.
(Bahawalpur Board-New Scheme-2014-A)

Sol. See Exercise Chapter No: 17 Answer No: 5

45. What is Parasympathetic Nervous System?
(Bahawalpur Board-New Scheme-2016-A)

Sol. Parasympathetic Nervous System: -

a. A few cranial nerves including the vagus nerves together with nerves form the bottom portion of spinal cord, form the parasympathetic nervous system.
b. Fibers of this system terminate in ganglia that lie near or within the organ.
c. The neurotransmitter used by parasympathetic system is acetylcholine (ACh).
d. It brings about the responses that are associated with a relaxed state; for example, it causes the pupil of the eye to contract, promotes digestion of food, and slows the heart beat.
(Note: - Cranial nerves III, VII, IX and X and second and third spinal sacral nerves and occasionally the first and fourth spinal sacral nerves constitute para-sympathetic nervous system. About 75 percent of all parasympathetic nerve fibers are in the vagus nerve (cranial nerve X) passing to entire thoracic and abdominal regions of the body.)

46. Give the functions of Androgens.
(Bahawalpur Board-New Scheme-2016-A)

Sol. Functions of Androgens: -

a. Androgens cause development of the secondary male characteristics.
b. They are also responsible for male primary characteristics.
c. They also stimulate spermatogenesis at puberty.

47. What are Meissner's Corpuscles?
(Bahawalpur Board-New Scheme-2017-A)

Sol. Meissner's Corpuscles: -

a. Meisner's corpuscles are encapsulated corpuscles in which nerve endings are spiral and much twisted, each of which ends in a knob.
b. These are present on body surfaces that do not contain hair such as finger tips, lips, nipples, palm, soles etc.
c. They are particularly sensitive to movement of objects over the surface of skin as well as to low-frequency vibration.

48. Define Hormones, Enlist their chemical composition.
(Bahawalpur Board-New Scheme-2018-A)

Sol. A) Hormones: -
Hormones are organic compounds that are produced by endocrine (ductless) glands and are poured directly and are transported to blood to respective target tissues.

B) List of Chemical Composition of Hormones: -
Chemically hormones may be of following four types:

a. Proteins (e.g. insulin and glucagon)
b. Amino acids and derivatives (e.g. thyroxine epinephrine and norepinephrine).
c. Polypeptides (e.g. vasopressin or ADH and oxytocin)
d. Steroids (e.g. estrogens, testosterone, and cortisone).

49. Differentiate between Kineses and Taxes behavior.
(Bahawalpur Board-New Scheme-2018-A)

Sol.

50. Give two similarities of nervous and chemical coordination.
(Faisalabad Board-New Scheme-2015-A)(DGK-I-19A)

Sol. Two Similarities of Nervous and Chemical Coordination: -

a. Both help in coordination of body.
b. Both are homeostatic in function.

51. What are commercial applications of abscisic acid?
(Faisalabad Board-New Scheme-2016-A)

Sol. Commercial Applications of Abscisic Acid: -
Abscisic acid can be sprayed on tree crops to regulate fruit drop at the end of the season. This removes the need for pickling over a large time-span.

52. What is sodium potassium pump?
(Faisalabad Board-New Scheme-2016-A)

Sol. Sodium Potassium Pump: -

a. It is cotransporter that actively moves sodium outside of a cell and potassium into it.
b. Nearly all the body's cells have sodium-potassium pumps, which maintain gradient by pumping sodium and potassium ions in opposite directions across the membrane.

c. Followings are the characteristics of sodium-potassium pump:
i. Sodium ions are kept tenfold higher in concentration outside than inside.
ii. Potassium ions are kept twenty times more concentrated inside than outside.
iii. For every two potassium ions that are actively transported inward, three sodium ions are pumped out.
d. Due to sodium potassium pump, inside of the membrane becomes more negative than the outside of the cell membrane of neurons.

53. What is cerebrospinal fluid? What is its function? (Faisalabad Board-New Scheme-2017-A)

Sol. A) Cerebrospinal Fluid: -
Cerebrospinal fluid (CSF) is a clear, colorless body fluid similar in composition to blood plasma found in the brain and spinal cord.

B) Function of Cerebrospinal Fluid: -
a. Cerebrospinal fluid (CSF) protects brain and spinal cord from trauma.
b. CSF supplies nutrients to nervous system tissues.
3. CSF removes waste products from cerebral metabolism.

54. Differentiate between mechanoreceptors and thermoreceptors. (Faisalabad Board-New Scheme-2018-A)

Sol.

Mechanoreceptors	Thermoreceptors
1. They detect stimuli of touch, pressure, hearing and equilibrium. 2. They are free nerve endings + expanded tip endings + stray endings.	1. They respond to cold and warmth. 2. They are only free nerve endings.

55. Name any two hormones of human gut. (Rawalpindi Board-New Pattern-2014-A)

Sol. Names of Any Two Hormones of Human Gut: -
a. Gastrin
b. Secretin

56. What is mid brain's reticular formation? (Rawalpindi Board-New Pattern-2015-A)

Sol. Mid Brain's Reticular Formation: -
a. It is a relay centre connecting hind brain with the fore brain.
b. It is very important in secreening the input information, before they reach higher brain centres.

57. Define nerve impulse. (Rawalpindi Board-New Pattern-2016-A)

Sol. Nerve Impulse: -
a. Nerve impulsre is a wave of electrochemical changes, which travels along the length of the neuron involving chemical reactions and movement of ions across the cell membrane.
b. Under normal conditions a nerve impulse is initiated by an appropriate stimulus (called threshold stimulus) applied at one end of the neuron.
c. Nerve impulse is initiated at only a portion of neuron. When it is initiated, resting membrane potential of nerve fiber disappears for perhaps a millisecond and is replaced by a new potential called active or action potential in which inner membrane surface becomes more positive than outside. During this state, polarity of nerve membrane first changes to +50 mv (i.e. depolarization) and then restores to -70 mv again (i.e. repolarization). The nerve impulse (i.e. action potential) then travels along the whole length of nerve fiber from beginning to end.

58. Give role of human gut as endocrine tissue. (Rawalpindi Board-New Pattern-2016-A)

Sol. Role of Human Gut as Endocrine Tissue: -
a. Mucosa of pyloric region of stomach produces a hormone known as gastrin when partially digested protein food touches it. Gastrin stimulates the secretion of gastric juice.
b. Lining of duodenum produces a hormone known as secretin when acidic food coming from stomach touches it. Secretin affects the pancreas to produce and release pancreatic juice and also affects the rate of bile production in liver.

59. What is reticular formation? (Rawalpindi Board-New Course-Group-II-2017-A)

Sol. See Rawalpindi Board Answer No: 6

60. Differentiate between thermoreceptors and nociceptors. (Rawalpindi Board-New Pattern-2018-A)

Sol.

Themoreceptors	Nociceptors
1. They respond to cold and warmth. 2. They are only free nerve endings.	1. They produce sensation of pain. 2. They have undifferentiated endings.

61. Define Resting Memebrane Potential. (Sargodha Board-New Scheme-2014-A)

Sol. Resting Memebrane Potential: -
a. A typical neuron at rest is more positive electrically outside than inside the cell membrane. This net difference in charge between inner and outer surface of a non-conducting neuron is called the resting membrane potential.
b. The resting membrane potential of a typical neuron is -70 mv.

62. Name various structures that protect our brain. (Sargodha Board-New Scheme-2016-A)

Sol. Names of Various Structure That Protect Our Brain: -
a. Carnium – A bony armour
b. Meninges
c. CSF

63. Differentiate between stimulus and response. (Sargodha Board-New Scheme-2017-A)

Sol. Differences Between Stimulus and Response: -

Stimulus	Response
1. Any internal or external change or signal that influences the activity of an organism or of part of an organism is called stimulus. 2. Stimulus is detected by specific type of receptor.	1. Response is the resulting reaction towards the stimulus. 2. Response is given by the effectors, usually the muscles or glands.

64. Give two commercial applications of 2,4 D.
(Sargodha Board-New Scheme-2017-A)

Sol. Two Commercial Applications of 2,4 D: -

a. 2,4 D is used to inhibit sprouting of potatoes.
b. 2,4 D is also used to retard abscission (premature fruit drop).

65. Differentiate between Corpus Callosum and Cerebral Cortex.
(Sargodha Board-New Scheme-2017-A)

Sol. Differences Between Corpus Callosum and Cerebral Cortex: -

Corpus Callosum	Cerebral Cortex
Corpus callosum is a thick band of nerve fibers of white matter between two hemispheres of cerebrum called cerebral hemispheres. 2. Human corpus callosum is composed of nearly 200 million axons. 3. Its main function is communication between two cerebral hemispheres.	Cerebral cortex is the layer of grey matter about 2 to 4 mm thickness on the outer surface of cerebrum. 2. Human cerebral cortex is made up of approximately 10 billions nerve cell bodies and their dendrites. 3. It receives sensory information, processes it, stores some in memory for future use, directs voluntary movements, and is responsible for thinking.

66. What are chemoreceptors?
(Sargodha Board-New Scheme-2018-A)

Sol. Chemoreceptors: -

a. Chemoreceptors detect chemicals dissolved in fluid medium surrounding them.
b. These are the receptors for smell, taste, concentration of oxygen, carbon dioxide, glucose, amino acids and fatty acids in blood.

67. Define Receptors. Give their types. (Mtn-16A)
(D.G.K.Board (New Course) Group-I-2014-A)

Sol. A) Receptors: -
Receptor is a cell, or neuron ending or a receptor organ that dects changes in the external and internal environment of the animal.

B) Types: -

a. Mechanoreceptors: -
Mechanoreceptors detect stimuli of touch, pressure, hearing and equilibrium.

b. Photoreceptors: -
They respond to stimuli of light for example in eyes, rods and cones.

c. Chemoreceptors: -
They are for smell, taste, and for blood oxygen, carbon dioxide, glucose, amino acids and fatty acids. They are found in tongue, nose and in the hypothalamus.

d. Thermoreceptors: -
These show response to cold and warmth.

e. Nociceptors: -
They produce the sensation of pain.

68. Write four important roles of Ethene.
(D.G.K.Board (New Course) Group-II-2014-A)

Sol. Four Important Roles of Ethene: -

a. It inhibits root growth.
b. It promotes fruit ripening.
c. It breaks dormancy of bud.
d. It promotes flowering in pineapple.

69. Name hormones secreted by Islets of Langerhans and their role.
(D.G.K.Board (New Course) Group-II-2014-A)

Sol. Names of Hormones Secreted By Islets of Langerhans And Their Role: -

A. Glucagon: -

a. It breaks down glycogen to glucose in the liver, leading to a rise in blood glucose.
b. It also increases the rate of breakdown of fats.

B. Insulin: -

a. It increases glycogen synthesis.
b. It increases cell utilization of glucose.
c. It stimulates conversion of glucose into lipid and protein.
d. It inhibits the hydrolysis of glycogen in the liver and muscle.

70. How instinctive behavior differs from learned behavior?
(D.G.K.Board (New Course) Group-I-2015-A)

Sol. Instinctive Behavior Different from Learned Behavior: -

Instinctive Behavior	Learning Behavior
1. It is not capable of modification. 2. It is inborn, genetically inherited. 3. It is performed for the first time, without previous experience. 4. It depends on the selection operating during the history of species. 5. It is found in animals with short life span and with little or no parental care. 6. It evolves gradually and slowly in the species. 7. Honebees inherit the tendency to fly towards flowers to seek nectar and pollen.	1. It is the modification of behavior. 2. The capacity to learn is inherited. 3. Previous experience has an obvious influence on this type of behavior. 4. It depends on the selection operating during the history of individual (during animal's life time). 5. It is found in animals which have long life span and parental care. 6. It evolves during the life history of an animal but ability to learn depends on heredity material of the animal. 7. Cat learns to press the lever to open the door of the cage in trial and error learning.

71. Give any two similarities between nervous and chemical coordination.
(D.G.K.Board (New Course) Group-I-2015-A)

Sol. Any Two Similarities Between Nervous and Chemical Coordination: -

a. Both help in coordination of body.
b. Both are homeostatic in function.

72. Anterior lobe of pituitary gland is called master gland. Discuss.
(D.G.K.Board (New Course) Group-I-2015-A)

Sol. Anterior Lobe of Pituitary Gland As Master Gland: -

Anterior lobe of pituitary gland is called master gland because in addition to producing primary hormones it produces the tropic hormones which control the secretion of hormones of many of the other endocrine glands.

73. Write down any four functions of Auxins.
(D.G.K. Board-New Course-Group-I-2017-A)

Sol. Four Functions of Auxins: -

a. They promote apical dominance.
b. They can, sometimes, induce parthenocarpy.
c. They promote cell enlargement in stem behind apex and cell division in cambium.
d. They inhibit abcession (premature fruit drop).

74. What is difference between somatic nervous system and autonomic nervous system.
(D.G.K. Board-New Course-Group-II-2017-A)

Sol. Difference Between Somatic Nervous System and Autonomic Nervous System: -

Somatic Nervous System	Autonomic Nervous System
1. It is voluntary nervous system. 2. Its function is to control and manage the movements of the skeletal muscles voluntarily.	1. It is visceral or involuntary nervous system. 2. It controls involuntary responses by influencing organs, glands and smooth muscles.

75. Define Acromegaly. Give its causes.
(D.G.K. Board-New Course-Group-I-2018-A)

Sol. A) Acromegaly: -

a. Acromegaly means large extremeties.
b. It is the abnormal development of hands, feet, jaws etc.

B) Cause of Acromegaly: -

Acromegaly is caused by excess production of somatotrohic hormone (STH), also called growth hormone GH).

76. What do you about Gastrin?
(D.G.K. Board-New Course-Group-II-2018-A)

Sol. Gastrin: -

1. It is the hormone produced by mucosa of pyloric region of the stomach.
2. It is produced under the influence of protein food in the stomach after it is partially digested.
3. It stimulates the secretion of gastric juice.

77. Differentiate between gastrin and secretin hormones.
(Sahiwal Board (New Scheme) 2014-A)(DGK-II-19A)

Sol. Differences Between Gastrin and Secretin Hormones: -

Gastrin	Secretin
1. It is produced by mucosa of pyloric region of the stomach. 2. It is produced when partly digested protein particles touch the lining of stomach. 3. It stimulates the secretion of gastric juice.	1. It is produced by the duodenum. 2. It is produced when acidic food touches the lining of duodenum. 3. It affects the pancreas to produce and release pancreatic juice as well as rate of bile production in the liver.

78. What is Secretin?
(Sahiwal Board-New Scheme-2015-A)

Sol. Secretin: -

a. It is produced by the duodenum.
b. It is produced when acidic food touches the lining of duodenum.
c. It affects the pancreas to produce and release pancreatic juice.
d. It also affects the rate of bile production in the liver.

79. What do you know about somatotrophin hormone (STH)? (Sahiwal Board-New Scheme-2015-A)

Sol. Somatotrophin Hormone (STH): -

a. Somatotrophin hormone (STH) or Growth hormone (GH) is secreted by the anterior lobe of pituitary.
b. Its secretion is controlled by a releasing factor known as Somatotrophin releasing factor (SRF) that is secreted from hypothalamus.. SRF is secreted throughout life.
c. STH regulates the growth of the body. When growth has mostly ceased after adolescence, the hormone continues to promote protein synthesis throughout the body.
d. In children, a deficiency of this hormone leads to dwarfism as well as other symptoms associated with lack of thyroid and adrenal hormones and an over secretion leads to gigantism.
e. In adults, excess somatotrophin hormone causes acromegaly which is characterized by abnormal development of hands, feet, jaws etc.

80. What are biological clocks? Define its types.
(Sahiwal Board-New Scheme-2017-A)

Sol. A) Biological Clocks: -

a. Biological clocks are behavioral activities of organisms that occur at regular intervals.
b. Biological clocks are also known as biological rhythms or biorhythms.
c. Basic period of the clock is innate.

B) Types of Biological Clocks: -

a. Circadian Clock: -

It shows the periodicity of 24 hours.

b. Circannual Clock: -

It shows the periodicity of 365 days.

81. What are neurons? Give examples.
(Sahiwal Board-New Scheme-2018-A)

Sol. A) Neurons: -

Neurons are cells that are chief structural and functional units of nervous system which transmit nerve impulses.

B) Examples: -

a. Sensory neurons
b. Associative neurons
c. Motor neurons

82. How Meissner's corpuscles be differentiated from Pacinian corpuscles?

(Azad Jammuu Kasmir Board -2017-A)

Sol. Meissner's Corpuscles Different From Pacinian Corpuscles: -

Pacinian Corpuscles	Meisner's Corpuscles
1. Pacinian corpuscles are encapsulated corpuscles in which the nerve ending is surrounded in concentric, onion-like layers of membranes alternating with fluid filled spaces. 2. They lie deep below the skin in the subcutaneous tissue. 3. They are particularly important for detecting vibration or other changes in mechanical state of tissues.	1. Meisner's corpuscles are encapsulated corpuscles in which nerve endings are spiral and much twisted, each of which ends in a knob. 2. These are present on body surfaces that do not contain hair such as finger tips, lips, nipples, palm, soles etc. 3. They are particularly sensitive to movement of objects over the surface of skin as well as to low-frequency vibration.

SECTION III

LONG QUESTIONS

1. Define and explain the nerve impulse. (4)
(Lahore Board-Session-2012-2014-Group I-2014-A)
2. Describe the initiation of nerve impulse . (4)
(Lahore Board-Session-2012-2014-Group-II-2014-A)
3. How nerve impulse is passed from on neuron to another neuron? Explain. (4)
(Grw-14A, Fsd-17A)
(Lahore Board-New Scheme-Group-I-2015-A)
4. Write a note on adrenal gland. (4)
(Lahore Board-New Scheme-Group-II-2015-A)(Mtn-15)
6. What are receptors, describe their different types. (4)
(Lahore Board-New Scheme-Group-II-2016-A)(Rwp-18A)
7. Discuss peripheral nervous system of man. (4)
(Lahore Board-New Scheme-Group-I-2018-A)
(Rwp-II-17A)
8. Write any four differences between nervous and chemical coordination. (4)
(Lahore Board-New Scheme-Group-II-2018-A)
9. Describe the functions of the thyroid gland. (4)
(Gujranwala Board-New Sheme-2015-A)
10. What is resting membrane potential? How it is maintained? (4)
(Gujranwala Board-New Sheme-2016-A)
11. Describe the functions of "abscisic acid" growth hormone in plant. (4)
(Gujranwala Board-New Sheme-2017-A)
12. Describe briefly the functions of different parts of human brain. (4)
(Multan Board (New Scheme) (2014-A)
15. What are Plant Hormones? Give the effects of Gibberellins and Ethene. (4)
(Multan Board-New Scheme-Group-I-2018-A)
16. Define nerve impulse. Explain factors responsible for resting membrane potential. (DGK-II-16A)
(Multan Board-New Scheme-Group-II-2018-A)
17. Explain Secretions and their role of anterior lobe of Pituitary Glan. (4)
(Fsd-14A, Sgd-14A, Ajk-17A, Lhr-I-19A, DGK-II-15, I-17A)
(Bahawalpur Board-New Scheme-2015-A)
18. Give detail of major factors which are involved in resting membrane potential. (4)
(Fsd-15A)
(Bahawalpur Board-New Scheme-2016-A)
19. What is a synapse? How a nerve impulse transmits through synaptic cleft?
(Faisalabad Board-New Scheme-2016-A)
20. Describe the functions and commercial application of cytokinins. (4)
(Faisalabad Board-New Scheme-2018-A)
21. Explain the roe of auxins in plants. (4)
(Rwp-15, DGK-II-18A)
(Rawalpindi Board-New Pattern-2014-A)
22. Discuss working of sensory receptors with special reference to skin.
(Rawalpindi Board-New Pattern-2016-A)
23. Define reflex Arc. Explain relax Arc with an example.
(DGK-II-14A)
(Rawalpindi Board-New Scheme-Group-I-2017-A)
24. What are neurons? Give their types and functions. (4)
(Sargodha Board-New Scheme-2016-A)(Sah-18A)
26. Write down four differences of diffused and central Nervous system. (4)
(Sargodha Board-New Scheme-2018-A)
27. What are receptors? Classify and explain each class. (4) (D.G.K.Board-New Scheme-Group-I-2014-A)
(Grw-19A)
28. Describe feedback mechanism with example. (4)
(Bwp-19A)
(D.G.K.Board-New Scheme-Group-I-2015-A)
29. Describe the role of Pancreas as an endocrine gland.
(SGD-19A)
(4) (D.G.K. Board-New Course-Group-I-2016-A)
30. Explain the endocrine function of pancreas. (4)
(D.G.K.Board-New Scheme-Group-II-2017-A)
31. Enlist the Gonadotrophic hormones and write function of each. (4)
(D.G.K. Board-New Course-Group-I-2018-A)
32. Write a note Thyroid Gland. (4)
(Sahiwal Board (New Scheme) (2014-A)
33. Write a note on nervous disorders. (4)
(Sahiwal Board-New Scheme-2015-A)
34. Define and explain briefly nerve impulse. (4)
(Sahiwal Board-New Scheme-2016-A)
35. Give general characteristics and commercial applications of Gibberellins. (2/½ + 1/½)
(Sahiwal Board-New Scheme-2017-A)(Rwp-19A)

Chapter ---- 18

REPRODUCTION

2 MCQs

I) From Exercise:-

1) Reproduction is very important to the survival of: (Dgk-II-19, Sah-19, Lhr-I-14, Grw-16, Rwp-15A-18A, Sgd-16) (Multan Board-2008-S)

a) Species b) Individual
c) Population d) Both a and b

3) Developing seeds are rich source of: (Mtn-14A, Bwp-19A)

a) Auxins b) Cytokinin
c) Gibberellins **d) All a, b, c**

4) Common methods of sexual reproduction are:

a) Tissue culture b) Identical twins
c) Cloning **d) All a, b, c**

II) From Punjab Boards:-

1) Vehicle for transport of male gamete in land plants is: (Lahore Board-New Scheme-Group-I-2014-A) (Rwp-18A, Sgd-16A)

a) Water **b) Pollen tube**
c) Pollen grain d) Wind

2) Parthenocarpy is induced in tomato and pepper by adding: (Lhr-I-16, Bwp-14A, Grw-19A) (Lahore Board-New Scheme-Group-II-2014-A)

a) Auxin b) Cytokinin
c) Ethene d) Abscisic acid

3) Average loss of blood during birth in human female is about: (Mtn-14A, Fsd-16A) (Lahore Board-New Scheme-Group-II-2014-A)

a) 150 cm^3 b) 250 cm^3
c) 350 cm^3 d) 450 cm^3

4) Germinating pollen grain is rich source of: (Lahore Board-New Scheme-Group-I-2015-A)(Sgd-17A)

a) Gibberellins **b) Auxin**
c) Cytokinnin d) Ethene

5) Fluid secreted by sertoli cells provides liquid medium, protection and nourishment to: (Lahore Board-New Scheme-Group-I-2015-A)

a) Oocyte **b) Sperms**
c) Polar body d) Spermatids

6) In honey bee, male sperms are produced by: (Lahore Board-New Scheme-Group-II-2015-A) (Grw-18A, Mtn-14A, DGk-I-14, Sah-19)

a) Meiosis **b) Mitosis**
c) Appomixis d) Parthenocarpy

7) All of the following animals are the haploid parthenogenetic except: (Lahore Board-New Scheme-Group-I-2017-A)

a) Wasps **b) Aphids**
c) Honey bees d) Ants

8) Uterus opens into the vestibule (vagina) through: (Lahore Board-New Scheme-Group-I-2017-A)

a) Cervix b) Ureter
c) Oviduct d) Uterine tube

9) Fruit ripening is due to the production of: (Gujranwala Board-New Scheme-2014-A)

a) Auxins b) Cytokinin
c) Gibberellin **d) Ethene**

10) Fruit development without fertilization is ---------: (Gujranwala Board-New Scheme-2015-A)

a) Dormancy b) Climacteric
c) Parthenocarpy d) Parthenogenesis

11) Sertoli cells are cells of: (Gujranwala Board-New Scheme-2017-A)

a) Testis b) Ovaries
c) Urethera d) Kidney

12) Diploid parthenogenesis occurs in: (Gujranwala Board-New Scheme-2017-A)

a) Wasp b) Ant
c) Aphid d) Bee

13) The inner soft wall of human uterus is called: (Gujranwala Board-New Scheme-2018-A)

a) Ectometrium b) Exometrium
c) Endometrium d) Myometrium

14) In all female mammals except human being desire for mating is called: (Multan Board-Old Scheme-2014-A)

a) Heat b) Cold
c) Menopause d) Gestation

15) Ovulation is induced by: (Multan Board-New Scheme-2016-A)

a) FSH **b) LH**
c) Estrogen d) Progesterone

16) From the beginning of third month of journey, the human embryo is referred to as the: (Multan Board-New Scheme-2016-A)

a) Foetus b) Placenta
c) Neonate d) Young one

17) The special condition of rest, which enables an embryo to survive during the long periods is: (Multan Board-New Scheme-Group-I-2017-A)

a) Root Dormancy b) Shoot Dormancy
c) Seed Dormancy d) Plant Dormancy

18) The internal fertilization leads to internal development of embryo which gives birth to young one, such animals are called: (Multan Board-New Scheme-Group-I-2017-A)

a) Oviparous **b) Viviparous**
c) Ovaviviparous d) Vivi-ovaparous

19) When sperms are in the tubules, the protection and nourishment is provided by: (Multan Board-New Scheme-Group-II-2017-A)

a) Sertoli cells b) Interstitial cells
c) Epididymis d) Seminiferous tubules

20) Corpus luteum secretes a hormone called: (Lhr-I-19A, II-18, DGK-II-18) (Multan Board-New Scheme-Group-II-2018-A)

a) Progesterone b) Oxytocin
c) Testosterone d) Estrogen

21) The human embryo is referred to as the fetus, from the beginning of:
(Bahawalpur Board-New Scheme-2015-A)
a) 3rd month b) 3rd week
c) 6th month d) 6th week

22) The total gestation period (Pregnancy) is usually about: (Bahawalpur Board-New Scheme-2015-A) (Sah-18A)
a) 250 days b) 260 days
c) 270 days **d) 280 days**

23) In human being, most of the major organs of embryo are formed within the:
(Bahawalpur Board-New Scheme-2017-A)(DGK-I-19)
a) Ten Weeks b) Six Weeks
c) Twelve Weeks d) Fourteen Weeks

24) The first convoluted part of vas-deferens is called:
(Bahawalpur Board-New Scheme-2017-A)
a) Scortum **b) Epididymis**
c) Seminiferous tubules d) Ureter

25) Which one is parthenogenic fruit?
(Bahawalpur Board-New Scheme-2018-A)
a) Apple **b) Pineapple**
c) Peach d) Mango

26) The total gestation period in human female is usually about:
(Bahawalpur Board-New Scheme-2018-A)
a) 280 days b) 250 days
c) 265 days d) 260 days

27) Syphilis is caused by:
(Faisalabad Board-Old Scheme-2014-A)
a) Sexual contact b) Gram positive bacteria
c) Spirochete d) HIV

28) Between seminiferous tubules are interstitial cells, which secrete: (DGK-I-15, II-17)
(Faisalabad Board-New Scheme-2014-A)
a) Estrogen **b) Testosterone**
c) Aldosterone d) Corticosteroids

29) Gonorrhea is caused by:
(Faisalabad Board-New Scheme-2016-A)
a) Treponema pallidum
b) Neisseria gonorrhoeae
c) HIV d) HCV

30) Haploid males produce sperms by mitosis in:
(Faisalabad Board-New Scheme-2017-A)
a) Hydra b) Earthworm
c) Honey bee d) Human

31) In human how many ova are usually discharged from the ovaries at one time?
(Faisalabad Board-New Scheme-2017-A)
a) 1 b) 2
c) 6 d) 3

32) Fruit ripening is often accompanied by a burst of respiratory activity, is called:
(Mtn-I-18A, Rwp-I-17, DGK-I-15,17, Sah-17A)
(Faisalabad Board-New Scheme-2018-A)
a) Fertilization b) Photoperiod
c) Climacteric d) Vernilization

33) Second meiotic division in oocytes, until fertilization proceeds as far as:
(Rawalpindi Board –New Pattern-2014-A)
a) Prophase **b)** Metaphase
c) Anaphase d) Telophase

34) Human embryo remains enclosed in a sac called:
(Rawalpindi Board –New Pattern-2014-A)
a) Placenta b) Chorionic sac
c) Amniotic sac d) Egg shell

35) External fertilization occurs in:
(Rawalpindi Board –New Pattern-2015-A)
a) Terrestrial environment
b) Aquatic environment
c) The reproductive tract of female
d) None

36) The end or complete stop of the menstrual cycle is called: (Rawalpindi Board –New Pattern-2016-A)
a) Menopause b) Emotional stress
c) Mal nourishment effect of cycle
d) Menstruation

37) The animals that lay shelled eggs to protect the developing embryo from the harsh terrestrial conditions are called:
(Rawalpindi Board –New Pattern-2016-A)
a) Oviparous b) Viviparous
c) Ovoviviparous d) Egg laying mammals

38) Evolution of pollen tube parallels the evolution of: (DGK-II-15)
(Rawalpindi Board-New Scheme-Group-I-2017-A)
a) Embryo b) Leaf
c) Fruit **d) Seed**

39) *Treponema pallidum* in humans causes:
(Sargodha Board-New Scheme-2017-A)
a) Gonorrhea **b) Syphilis**
c) Genital Herpes d) AIDS

40) Syphilis is caused by a spirochaete named as:
(Sargodha Board-New Scheme-2018-A)(AJK-17A)
a) *Nisseria gonorrheae*
b) *Treponema pallidum*
c) *Escherechia coli*
d) *Hyphomicrobium*

41) Parthenocarpy is the development of fruit without:
(D.G. K. Board-New Scheme-Group-I-2014-A)
a) Pollination b) Germination
c) Fertilization d) Hormones

42) Discharge of egg from ovary is called:
(D.G. K. Board-New Scheme-Group–II-2014-A, 2016) (Sah-15A, Lhr-I-19)
a) Ovulation b) Oogenesis
c) Gametogenesis d) Menstrual cycle

43) The hormone responsible of production of sperm cells and male secondary sexual characteristics during puberty is:
(D.G.K. Board-New Scheme-Group-I-2016-A)
a) Progesterone **b) Testosterone**
c) Thyroxine d) Estrogen

44) The disease caused by a gram positive bacterium *Naisseria* is called:
(D.G.K. Board-New Scheme-Group-I-2017-A)
a) *Gonorrhea* b) Syphilis
c) Herpes d) AIDS

45) A type of sexual reproduction in which parent organism simply divides into two daughter organisms is:
(D.G.K. Board-New Scheme-Group-II-2017-A)
a) Budding b) Multiple fission
c) Binary fission d) Nuclear fission

46) Plant hormone Florigen is produced in:
(D.G.K. Board-New Scheme-Group-II-2018-A)
a) Flowers b) Roots
c) Stem **d) Leaves**

47) Cause of Syphilis is:
(Sahiwal Board-New Scheme-2014-A)
a) *Neisseria* **b) *Treponema***
c) Myobacterium d) AIDS

48) Labor pains are induced by:
(Sahiwal Board-New Scheme-2014-A)
(Fsd-15A, Sah-17)
a) Progesteron **b) Oxytocin**
c) Corticosteroids d) Estrogen

49) Sperms are formed in:
(Sahiwal Board-New Scheme-2015-A)
a) Vas deferens b) Collecting ducts
c) Epididymis **d) Semineferous tubules**

50) Fertilization is the process which leads to the union of: **(Sahiwal Board-New Scheme-2016-A)**
a) Individuals **b) Gametes**
c) Sperms d) Eggs

51) Oestrous cycle, a reproductive cycle is found in all females except:
(Sahiwal Board-New Scheme-2018-A)
a) Cat b) Cow
c) Human being d) Lion

52) Duckbill platypus is a:
(Azad Jammu Kashmir Board-2017-A)
a) Oviparous b) Viviparous
c) Ovoviviparous d) Ovioviviparous

III) From Entry Test:-

1) Syphilis is caused by: (Entry Test-2007-2012-2015)
a) *Neisseria gonorrhoeae* **c) *Treponema pallidum***
b) Catsworm d) Herpes simplex

3) Discharge of ovum or secondary oocyte from ovary or from Graffian follicle is called:(Entry Test-2012)
a) Fertilization c) Follicle formation
b) Pollination **d) Ovulation**

4) Secondary meiotic division in the secondary oocyte procedes as for as: (Entry Test-2012)
a) Metaphase c) Anaphase
b) Prophase d) Telophase

5) Which of the followings differentiates directly into mature sperm? (Entry Test-2012)
a) Primary spermatocyte c) Spermatogonia
b) Secondary spermatocyte **d) Spermatid**

6) Uterus opens into the vagina through: (Entry Test-2012)
a) Cervix c) External genitalia
b) Fallopian tube d) Vulva

7) Which one of the following hormones is essential for successful production of sperms: (Self-Test Questions-2013)
a) LH (luteinizing Hormone)
b) Gonadotropin hormone
c) Testosterone
d) Follicle stimulating hormone

8) *Treponema pallidum* cause a disease (sexually transmitted) called: (Self-Test Questions-2013)
a) Genital Herpes c) Gonorrhea
b) AIDS **d) Syphilis**

9) The fertilization of ovum takes place in proximal part of the: (Self-Test Questions-2013)
a) Uterus c) Placenta
b) Oviduct d) Urethra

10) Pregnancy is maintained by the: (Self-Test Questions-2013)
a) LTH (Luteotropic hormone) c) Corticosteroids
b) Progesterone d) LH and FSH

11) At which month pregnancy the human embryo is referred to as the fetus? (Self-Test Questions-2013)
a) 3rd month c) 6th month
b) 4th month d) 2nd month

12) Spermatogonia differentiate directly into: (Entry Test-2013)
a) Primary spermatocytes c) Spermatozoa
b) Secondary spermatocytes d) Spermatids

13) What is the location of interstitial cells in testes? (Entry Test-2013)
a) Inside the seminiferous tubules
b) Between the seminiferous tubules
c) Among the germinal epithelial cells
d) Around the testes

14) A type of cells in human testes which produce testosterone are called: (Entry Test-2013-2014)
a) Germ cells **c) Interstial cells**
b) Sertoli cells d) Spermatocytes

15) The hormones produced from corpus luteum is: (Entry Test-2013)
a) Prolactin **c) Progesterone**
b) FSH d) LH

16) The oocyte released during ovulation is in: (Entry Test-2014)
a) Anaphase I c) Metaphase I
b) Prophase I **d) Metaphase II**

17) Yellowish glandular structure formed after the release of egg from follicle is called: (Entry Test-2014)
a) Corpus callosum **c) Corpus luteum**
b) Graafian follicle d) Follicle atresia

18) On puberty, the development of primary follicles is stimulated by: (Entry Test-2014)
a) ICSH c) LH
b) FSH d) Estrogen

19) Causative agent of a sexually transmitted disease that affects mucous membrane of the urinogenital tract is: (Entry Test-2014)
a) *Staphylococcus aureus*
b) *Treponema pallidum*
c) *Neisseria gonorrheae*
d) *Escherichia coli*

20) In human testis, which structure is responsible for carrying sperm from inside the testis? (Entry Test-2015)
a) Seminiferous tubules c) Seminal vesicles
b) Urinogenital duct **d) Vasa efferentia**

21) In which part of female reproductive system fertilization takes place? (Entry Test-2015)
a) Proximal part of oviduct c) Placenta
b) Uterus d) Vagina

22) In females, FSH stimulates the ovary to produce: (Entry Test-2015)
a) Progesterone **c) Oestrogen**
b) Lactin d) Oxytocin

23) In which phase of human female menstrual cycle, endometrium prepares for the implantation of embryo? (Entry Test-2015)
a) Proliferative phase **c) Secretory phase**
b) Menstrual phase d) Ovulation phase

24) Decrease of FSH and increase of estrogen cause pituitary gland to secrete: (Entry Test-2016)
a) Somatotropin c) Testosterone
b) Luteininzing Hormone d) Spermatogonium

25) Transmission of Neisseria gonorrhea is best described by which one of the following? (Entry Test-2016)
a) Oral-fecal Route c) Vector born
b) Unsafe sex d) Droplet infection

26) Syphilis is caused by: (Entry Test-2016)
a) Spirochete c) Water blooms
b) Nostoc d) Cyanobacteria

27) AIDS is caused by: (Entry Test-2016)
a) Bacteria c) Fungi
b) Virus d) Alga

28) ---------- is the structure in female reproductive system in which fertilization takes place. (Entry Test-2017)
a) Ovaries c) Cervix
b) Uterus **d) Oviduct**

29) Which of the following directly develop into Sperms? (Entry Test-2017)
a) Primary spermatocytes
b) Spermatids
c) Secondary spermatocytes
d) Spermatogonia

30) FSH stimulates the production of oestrogen Hormone which has two targets ---------- and ---------- . (Entry Test-2017)
a) Uterus, posterior pituitary
b) Ovaries, uterus
c) Uterus, anterior pituitary
d) Ovaries, hypothalamus

31) Syphilis is sexually transmitted disease and can also damage: (Entry Test-2017)
a) Hair c) P.N.S
b) Heart d) Birth canal

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. What changes occur in ovulation and menstruation during pregnancy?

Sol. Ovulation and menstruation stop during pregnancy due to hormonal changes.

2. What is the difference between oogenesis and spermatogenesis?

Sol.

Oogenesis	Spermatogenesis
1. It is the production of female gametes (ova) by the meiosis and maturation.	1. It is the production of male gametes (sperms) by meiosis and maturation.
2. It occrs in the ovaries of females.	2. It occrs in the testes of males.
3. It produces one egg or ovum per meiosis.	3. It produces four sperms or spermatozoa per meiosis.
5. It does not always go to completion.	5. It always goes to completetion.

3. How is seed formed?

Sol. Formation of Seed:

After fertilization, the developing seeds are not only rich source of auxins and gibberellins, but also of cytokinins. These growth substances are mainly associated with development of the embryo and accumulation of food reserves in the seed. Following steps take place in the development of seed:

a. Diploid zygote develops into embryo consisting of hypocotyle (with radicle), epocicotyle (with plumule) and coteledons.
b. The triploid endosperm nucleus divide mitotically to from endosperm tissue. In most flowering plants endosperm provides nutrients for the embryo while in many others, it disappears completely by the time the seed is mature.
c. Integuments harden and become the seed coat of a seed.
d. Haploid cells remaining in the embryo sac (antipodals, synergids, tube nucleus) degenerate.

4. What is the importance of seed in the life cycle of a plant?

Sol. Importance of Seed in the Life Cycle of a Plant: -

1. In seed, embryo is protected from drought and other unfavorable environmental conditions.
2. Seed can easily be dispersed.
3. Seed introduces the dormant phase in the life cycle of a plant that allows the embryo to survive until environmental conditions are favorable for further growth.

II) From Punjab Boards:-

1. Explain estrous cycle.
(Lhr-II-16A, Bwp-15A, Rwp-14A, 15A, Lhr-II-19A, DGK-I-16, II-17A)
(Lahore Board (Session-2012-14) Group-I-2014-A)

Sol. Oestrous Cycle: -

a. A period of increased mating desire found in mammals except primates is called as Oestrous or Heat period.
b. The structural and physiological changes occurring from one period of oestrous to the next is called as Oestrous Cycle.
c. In this cycle:
i. The estrogen prepares the uterus for conception.
ii. Follicle develops ova.
iii. Female needs a physical stimulus of mating for ovulation and exhibits the desire for mating. Female is said to be on heat.
d. The cycles of these animals vary in length and frequency.
e. Oestrous cycle may occur only once a year in some mammals and in others twice a year and in some more often.

2. What is meant by lactation? How it is controlled?
(Lahore Board (Session-2012-14) Group-I-2014-A)(SGD-14A)

Sol. A) Lactation: -
It is the production and release of milk by mammary glands of human females for nourishing young.

B) Control of Lactation: -
It is controlled by following hormones:
a. Estrogen b. Progesterone
c. Prolactin d. Leutotrophic hormone (LTH)
e. Placental lactogen

3. How identical twins and fraternal twins are prodced?
(Lahore Board (Session-2012-14) Group-I-2014-A)
(Grw-14A, DGK-I-16A, Rwp-14A, I-17A)

Sol. A) Production of Identical Twins: -
After fertilization, zygote undergoes cleavage (cell division by mitosis). When embryo is at two cell stage, the two blastomeres, instead of remaining together, may separate and behave as two independent zygotes, giving rise to two genetically identical twins.

B) Production of Fraternal Twins: -
In some cases, two eggs are produced by the female and both these eggs are independently fertilized forming two zygotes. These zygotes develop into two genetical different fraternal twins.

4. What is Apomixis?
(SGD-19A, I-19A, DGK-II-15A, Sah-18)
(Lahore Board (Session-2012-14) Group-II-2014-A)

Sol. Apomixis: -

1. It is a form of parthenogenesis, in which seeds are produced without flowers being fertilized.
2. In apomixes;
a. Embryo in the seed develops from a diploid cell in the ovule (either from the nuccellus or megaspore) rather than from a diploid zygote (formed from the union of haploid gametes).
b. The rest of the ovule develops into the seed.
c. The ovary develops into fruit.
3. Apomixis is found in potatoes, certain grasses (such as Kentuchy blue grass), dandelions, citrus trees, mango, blackberries and garlic.

5. What are test tube baby?
(SGD-16A, Grw-19A, Rwp-19A, Bwp-16A, Fsd-14A, Rwp-16A)
(Lahore Board (Session-2012-14) Group-II-2014-A)

Sol. Test Tube Baby: -

a. Test tube baby is a technique, also called in vitro fertilization, in which parental sperm and ovum is fertilized in vitro- outside the female body and then the zygote is implanted back into the mother uterus, placenta establishes and remaining development takes place in the body of the mother leading to normal birth.
b. Parents which are unable to enjoy the normal process of fertilization and birth of their offspring due to some physiological and physical abnormalities in any two parents are being benefited with this method.

6. What is seed dormancy? Give its importance.
(DGK-I-14A, 17A, Fsd-18A, Lhr-15A, Grw-15A, Ajk-17A)
(Lahore Board (Session-2012-14) Group-II-2014-A)

Sol. A) Seed Dormancy: -
Seed dormancy is a special condition of rest in which the embryo seases or limits its growth and has very low metabolic rate.

B) Importance of Seed Dormancy: -
Seed dormancy enables an embryo to survive the long periods of unfavorable environmental conditions, such as water scarcity or low temperature. This is of great survival importance to the plant in that it prevents the dormant seed from germinating in response to conditions such as warm spell in winter, which, although apparently favorable, are only temporary.

7. What is haploid parthenogenesis?
(Lhr-II-16, DGK-I-14A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Haploid Parthenogenesis: -

1. Parthenogenesis in which haploid egg develops into haploid individual without its fertilization by the haploid male gamete is called Haploid parthenogenesis.
2. It occurs in ants, bees, and wasps.
3. In honeybees, for example, a queen bee mates only once and stores the sperm in a pouch closed off in a valve. She has the ability to lay eggs that have not been fertilized. When she lays egg without being fertilized they develop into haploid male drones.

8. How identical twins are produced? (Sgd-17A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Production of Identical Twins: -
After fertilization, zygote undergoes cleavage (cell division by mitosis). When embryo is at two cell stage, the two blastomeres, instead of remaining together, may separate and behave as two independent zygotes, giving rise to two genetically identical twins.

9. Describe gonorrhea.
(Bwp-15A, DGK-II-18A, Bwp-19A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Gonorrhea: -

a. It is caused by a gram positive bacterium *Neisseria gonorrhoeae*.
b. The bacterium is introduced in the body through sexual contact, usually through genital and oral contact.
c. The bacterium mainly affects the mucous membrane of urinogenital tract and cause wounds in genital tubes.
d. New born babies which pass through birth canal of infected mother acquire eye infection and can become blind if not treated immediately.

10. What are fraternal twins? (Mtn-16, I-17A, Rwp-16A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Fraternal Twins: -

1. They are developed when two eggs are produced by the female and both these eggs are independently fertilized forming two zygotes.
2. As each egg is fertilized by a separate sperm hence the genotype of each zygote is different from the other.
3. They need not be of the same sex.
4. Each member of fraternal twin has its own placenta and amnion.
5. They are the product of sexual reproduction.

11. Differentiate between oviparous and viviparous.
Lhr-I-19A, Grw-14A, Mtn-II-17, Sah-14-18A)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Differences Between Oviparous and Viviparous: -

Oviparous	Viviparous
1. The animals which leave the body of mother as eggs are called oviparous.	1. The animals which leave body of the mother (in sea horses, the father) at an advanced stage of development and give birth to young are called viviparous animals.
2. Their eggs may or may not be surrounded by shell.	2. Eggs are without shell.
3. Fertilization is external in some and internal in others.	3. Fertilization is internal in all.
4. Development of their young take place outside the mother body in the laid eggs.	4. Their young develop inside the parent.
5. During development, young obtain nourishment from the egg yolk.	5. Their young obtain nourishment directly from the mother's body rather than from egg yolk

12. Differentiate the internal and external fertilization.
(Lahore Board-New Scheme-Group-I-2018-A)(DGK-I-15A)

Sol. Differences Between the Internal and External Fertilizations: -

Internal Fertilization	External Fertilization
1. It is the union of gametes inside the body of the female.	1. It is the union of gametes outside the body.
2. It occurs in many aquatic and some land animals.	2. It occurs in all land animals and some aquatic animals.
3. Sperms are lodged in the female body at more or less the same time when eggs are released for fertilization.	3. Sperms and eggs are shed in the water at the same time and at the same place
4. It leads to external development in reptiles and birds and internal development in mammals.	4. It leads only to the external development.
5. In internal fertilization, usually one or few female gametes are produced.	5. In external fertilization, a large number of both gametes are produced.
6. Examples include nematodes, some mollusks, arthropods, most bony fishes, most amhibians, all reptiles, birds and mammals.	6. Examples include most cartilaginous fishes and most amphibians.

13. What is menopause? At what age it starts?
(Sah-17A, SGD-14A, DGK-I-14I-18A, Fsd-14A, Rwp-II-17A)
(Gjranwala Board (New Scheme) (2014-A)

Sol. A) Menopause: -
The end or complete stop of the menstrual cycle is called menopause, after which the female stops producing the ova.

B) Menopause at Which Age Starts: -
Menopause starts at the age of 40 or 45.

14. What is syphilis? (Bwp-14A, Rwp-18A)
(Gjranwala Board-New Scheme-2015-A)

Sol. Syphilis: -

a. It is caused by a spirochaete *Treponema pallidum*.
b. Sexual contact is the major source of its transmission. Congenital transmission is also found in syphilis.
c. It damages the reproductive organs, eyes, bones, joint, central nervous system, heart and skin of the infected person.

15. What is genetal herpes?
(Mtn-14A, Sah-14, 17A, DGK-II-19)
(Gjranwala Board-New Scheme-2016-A)

Sol. Genetal Herpes: -

a. It is caused by a herpes simplex type 2 virus.
b. It is transmitted by sexual contact.
c. In infected pregnant woman, virus can be transmitted to infant during birth.
d. It causes infection of genitalia.
e. It is characterized by genital soreness and ulcers on or around the external geneital organs, fever and pain.
f. In new born babies, it can cause damage to eyes and and CNS leading to neurological disorder and even death.

16. Define parthenocarpy with examples.
(Sah-18A, Grw-18A, Fsd-15A)
(Gjranwala Board-New Scheme-2016-A)

Sol. Parthenocarpy With Examples: -

a. The rocess in which fruit formation takes place without pollination and fertilization is called parthenocarpy

b. Banana, pineapple, grapes and some orange varities are naturally produced by parthenocarpy due to hormonal imbalance, usually high auxin levels occurring in their ovaries.
c. It is sometime artificially induced for commercial purposes, by adding auxins as in tomatoes, peppers etc.

17. Define placenta. Give its function.
(Gjranwala Board-New Scheme-2017-A)

Sol. A) Placenta: -
Placenta is the tissue attaching the embryo to the wall of the uterus. It consists the portion of the chorion of the embryo that develops villi, together with underlaying uterine tissue that contains maternal capillaries and small pools of maternal blood.

B) Function of Placenta: -
a. Placenta provides nutrients and oxygen for fetus from the mother blood.
b. Placenta removes wastes and carbon dioxide from the fetus to maternal blood which the mother excretes.
c. Placenta can selectively filter many types of materials and microorganisms coming from mother.
d. It also produces hormones that regulate pregnancy.

18. What is diplohaplontic life cycle? Give its types.
(Gjranwala Board-New Scheme-2018-A)(Grw-19A)

Sol. A) Diplohaplontic Life Cycle: -
Diplohaplontic lfe cycle in plants is the life cycle in which diploid sporophyte and haploid gametophyte generations alternate with each other.

B) Types of Diplohaplontic Life Cycle: -
a. Isomorphic --- When two generations are vegetatively similar
b. Heteromorphic --- When two gnenrations are vegetativley dissimilar

19. Define Fruit set.(Multan Board-New Scheme-2015-A)
(Rwp-I-17A, DGK-I-17)

Sol. Fruit Set: -
a. It is retention of the ovary which becomes the fruit after fertilization.
b. Production of auxin by germinating pollen grain, the tissues of style and ovary is necessary for fruit set.
c. Auxin is continually produced by the ovary and the ripe seed after fertilization, which stimulates fruit development.
c. Auxins, and other growth substances (giberrellins and cytokinins) are produced by developing seeds that are mainly associated with development of embryo and accumulation of food reserves in the seed, and sometimes in the pericarp (fruit wall).
d. Another plant hormone, ethane, is associated with climactric (burst of respiratory activity) and helps in ripening of the fruit.

20. Define Diploid Parthenogenesis with example.
(Multan Board-New Scheme-2015-A)

Sol. Diploid Parthenogenesis With Example: -
a. It is a type of parthenogenesis in which the egg producing cells of the female undergo a modified form of meiosis involving total non disjunction of chromosomes, they retain the diploid number of chromosomes. Egg (diploid) develops into young female.
b. It is found in aphids.

21. Define Fruit. (Multan Board-New Scheme-2016-A)

Sol. Fruit: -
Fruit is a mature, ripened ovary or group of ovaries containing the seeds in angiosperms. Or
a. Fruit is the mature, ripened ovary of flowering plants.
b. It contains seeds.
c. It may be dry or fleshy.
d. It may be simple, aggregate or multiple.

22. What is Corpus Luteum ? What is its function?
(DGK-II-18A, 17A, SGD-18A)
(Multan Board-New Scheme-Group-I-2017-A)

Sol. A) Corpus Luteum : -
It is a yellow glandular body formed in ovary ruptured follicles after release of egg.

B) Function of Carpous Luteum: -
The function of corpus luteum is to secrete progesterone. Progesteron develops the endometrium and make it receptive for the implantation of zygote (placental formation)

23. What is meant by "After birth"? (Lhr-I-16)
(Multan Board-New Scheme-Group-I-2018-A)

Sol. After Birth: -
a. The detaching of the placenta from the uterine wall and its expulsion a short time after the birth of the baby is called After Birth.
b. Within 10-45 minutes after birth, the uterus contracts and separates the placenta from the wall of the uterus and placenta then passes out through vagina. This is called After birth.
c. Separation of the placenta opens the placental sinuses and causes bleeding. Bleeding, throughout this period, is controlled by the contraction of smooth muscle fibers which completely surround all blood vessels supplying the placenta. Average loss of blood is about 350 cm^3.

24. Write the functions of sertoli cells. (Sah-17A)
(Multan Board-New Scheme-Group-I-2018-A)

Sol. Functions of Sertoli Cells: -
Fluid secreted by sertoli cells provide liquid medium, protection and nourishment to sperms while they are in the seminiferous tubules.

25. Name the hormones secreted by Placenta.
(Bahawalpur Board-New Scheme-2016-A)

Sol. Names of the Hormones Secreted By Placenta: -
a. Progesterone
b. Placental lactogen

26. Define Gonorrhea and AIDS.
(Bahawalpur Board-New Scheme-2017-A)

Sol. A) Gonorrhea: -
a. It is caused by a gram positive bacterium *Neisseria gonorrhoeae*.
b. The bacterium is introduced in the body through sexual contact, usually through genital and oral contact.

B) AIDS: -
a. AIDS means Acquired Immune Deficiency Syndrome and is caused by the human immunodeficiency viruses (HIV).

b. HIV consists of two molecules of RNA and two molecules of reverse transcriptase. A spherical protein capsid surrounds the genome and a lipid-protein envelope with spikes of protein lies outside capsid.

c. The major cell infected by HIV is the helper T-Lymphocyte which is a major component of immune system. Cells of nervous system can also be infected by HIV.

27. What is Follicle Atresia? (AJK-17A)
(Bahawalpur Board-New Scheme-2018-A)

Sol. Follicle Atresia: -

a. Follicle atresia is degenerative process in which all developing follicles except one (that continues to grow with its primary oocyte) break down.

b. Developing follicles usually degenerate and become scar tissue by atresia.

c. Until puberty all the follicles that start to develop undergo atresia in the early stages without ever ovulating.

28. Give the importance of asexual reproduction.
(Faisalabad Board-New Scheme-2015-A)

Sol. Importance of Asexual Reproduction: -

a. An advantage of asexual reproduction is that the organisms increase in number very rapidly which are morphologically and genetically alike to their parent. However, this blocks the process of evolution and adaptation and it may destroy the survival of species at any stage.

b. Man uses this method for the production of the same type of crop by tissue culturing in plants.

c. Moreover, cloning in animals (a type of asexual reproduction) is being adapted for producing organisms of valuable characteristics, without a change in their genetic makeup.

29. Differentiate between oviparity and viviparity.
(Faisalabad Board-New Scheme-2015-A)

Sol. Differences Between Oviparity and Viviparity: -

Oviparity	Viviparity
1. Oviparity refers to a type of reproduction in which the eggs are developed after leaving the body of the mother.	1. Viviparity refers to reproduction in which eggs develop within the mother's body and young are born free-living.
2. Eggs may or may not be surrounded by shell.	2. Eggs are without shell.
3. Fertilization is external in some and internal in others.	3. Fertilization is internal in all.
4. Development of young take place outside the mother body in the laid eggs.	4. Young develop inside the parent.
5. During development young obtain nourishment from the egg yolk.	5. The young obtain nourishment directly from the mother's body rather than from egg yolk
6. The animals laying eggs are called oviparous.	6. The animals giving birth to young ones are called viviparous.
7. Oviparity is found in some bony fish, most reptiles, some cartilaginous fish, some amphibians, a few mammals, and all birds.	7. Viviparity is found in most cartilaginous fish, some amphibians, a few reptiles, and almost all mammals.

30. Differentiate between oogenesis and spermatogenesis.
(Faisalabad Board-New Scheme-2016-A)

Sol. Differences Between Oogenesis and Spermatogenesis:

Oogenesis	Spermatogenesis
1. It is the production of female gametes (ova) by the meiosis and maturation.	1. It is the production of male gametes (sperms) by meiosis and maturation.
2. It occurs in the ovaries of females.	2. It occurs in the testes of males.
3. It produces one egg or ovum per meiosis.	3. It produces four sperms or spermatozoa per meiosis.
5. It does not always go to completion.	5. It always goes to completetion.

31. How seedless fruits are formed?
(Faisalabad Board-New Scheme-2016-A)

Sol. Formation of Seedless Fruits: -

Seedless fruits are formed by adding auxin in the ovary of flowers of tomato, peppers etc.

32. Differentiate haploid parthenogenesis and diploid parthenogenesis. (DGK-II-16A)
(Faisalabad Board-New Scheme-2017-A)

Sol. Differences Between Haploid Parthenogenesis and Diploid Parthenogenesis: -

Haploid Parthenogenesis	Diploid Parthenogenesis
1. Haploid eggs are produced by meiosis.	1. Diploid eggs are produced by a modified form of meiosis involving total non-disjunction of chromosomes.
2. Haploid egg develops without fertilization into haploid drone male.	2. Diploid egg without fertilization develops into diploid female.
3. It is found in ants, bees and wasp.	3. It is found in aphids.

33. How process of child birth is initiated in human?
(Rawalpindi Board-New Pattern-2015-A)

Sol. Process of Child Birth Initiation in Human: -

Process of child birth is initiated in human in the following way:

a. First ACTH is released from the fetal pituitary gland.

b. ACTH in turn stimulates the fetal adrenal gland to release corticosteroids.

c. Corticosteroids cross the placenta barrier and enter the maternal blood circulation causing a decrease in maternal prgesteron production.

d. Reduction of progesterone level in the mother stimulates the pituitary gland to release oxytocin hormone that induces labor pains in the mother initiating the actual process of child birth.

34. Define Gestation period and After birth.
(Rawalpindi Board-New Pattern-2015-A)

Sol. A) Gestation Period: -

a. The period starting from conception upto the birth of baby is called Gestation period.

b. It is commonly known as pregnancy period.

c. The total gestation period in humans is usually about 280 days.

B) After Birth:

The detaching of the placenta from the uterine wall and its expulsion a short time after the birth of the baby is called After Birth.

35. Differentiate between menstrual cycle and oestrous cycle. (Rawalpindi Board-New Pattern-2016-A) (Rwp-19A)

Sol.

Oestrous Cycle	Menstrual Cycle
1. It is found in the females of all mammals except primates (monkeys, apes and humans). 2. Oestrous cycle may occur only once a year in some mammals and in others twice a year and in some more often. 3. All mammals with estrous cycle show degeneration of uterine wall between successive ovulation as primates, but changes are usually not so drastic that blood is lost. 4. Mammals with estrous or heat period have mating desire only during that time.	1. It is found in the females of primates. 2. In human female it occurs after 28 days. 3. In menstrual cycle, ovulation occurs and if ovum is not fertilized and implanted in the uterus, uterine wall is broken down with the discharge of blood, mucous and cellular debris through vagina. 4. Mammals with menstrual cycle have the unusual habit of mating desire and breeding thought the whole year.

36. Differentiate between tissue culture and cloning. (Sargodha Board-New Scheme-2014-A)(Grw-15A)

Sol. Two Examples of Short Day Plant: -

a. Soybean
b. Tobacco

37. Define terms menstruation and menopause. (Sargodha Board-New Scheme-2016-A)

Sol. A) Menstruation: -

a. It is monthly discharge of blood and degenerated uterine lining in the menstrual cycle of human female.
b. Appearance of first menstruation marks the beginning of each menstrual cycle and is one of the signs of puberty.
c. It occurs between 15 and 40 of age.
d. It lasts for 7 days.

B) Menopause: -

The end or complete stop of the menstrual cycle is called menopause, after which the female stops producing the ova.

38. Define Climacteric. (D.G.K.Board-New Course-Group-II-2015-A)

Sol. Climacteric: -

a. It is a burst of respiratory activity leading to fruit ripening.
b. It is associated with ethane production.
During climacteric, ripening fruits undergo an integrated set of changes, including a decline in organic acid, an increase in sugar content, softening and often a color change.
c It helps in ripening of fruit.

39. Differentiate between Lactation and Gestation. (D.G.K.Board-New Course-Group-II-2015-A)(DGK-II-18)

Sol. Differences Between Lactation and Gestation: -

Lactation	Gestation
1. It is the period of production and release of milk from mammary glands for the nourishment of new born baby. 2. Its period in human female is about two years and depends upon the nursing of the baby. The more the infant nurses, the more milk is produced for the next feeding.	1. It is period starting from conception upto the birth of a baby. 2. The total gestation period in human female is usually about 280 days (nine months).

40. Name two Sexually Transmitted diseases and their control. (D.G.K. Board-New Course-Group-I-2016-A)

Sol. A) Names of Two Sexually Transmitted Diseases: -

a. AIDS
b. Syphilis

B) Control of Two Sexually Transmitted Diseases: -

a. Avoid sexual contacts with carrier or diseased person.
b. Adopt hygienic conditions.

41. Write two differences between asexual and sexual reproduction. (DGK-I-19A) (D.G.K. Board-New Course-Group-II-2016-A)

Sol. Two Differences Between Asexual and Sexual Reproduction: -

Asexual Reproduction	Sexual Reproduction
1. Only one parent is required. 2. Offspring's are genetically identical to the single parent.	1. Mostly two parents are required. 2. Offspring genetically differ from their parents.

42. How implantation differs from gestation? (D.G.K. Board-New Course-Group-I-2018-A)

Sol. Implantation Different From Gestation: -

Implantation	Gestation
It is the attachment of embryo of about 128 cells called blastocyst in the thickened lining of the uterus for further growth and development..	It is the period of growth and development of a fetus in the uterus of a mammal upto birth after implantation of the embryo.

43. Define reproduction. What is its significance? (Sahiwal Board (New Scheme) 2014-A)

Sol. A) Reproduction: -

The process by which the organisms produce offsprings of their own kind is called reproduction.

B) Significance of Reproduction: -

Reproduction is the most fundamental function of living thing. It is essential for continuity and survival of the species.

44. What do you know about the term oviparity? (Sahiwal Board-New Scheme-2015-A)

Sol. Oviparity: -

a. Oviparity refers to a type of reproduction in which the eggs are developed after leaving the body of the mother.
b. Eggs are usually surrounded by shell to protect the developing embryo from harsh terrestrial environment.

c. Development of young takes place outside the mother body in the laid eggs.
d. During development young obtain nourishment from the egg yolk.
e. Oviparity is found in some bony fish, most reptiles, some cartilaginous fish, some amphibians, a few mammals, and all birds.

45. Differentiate between isomorphic and heteromorphic generations. (Sahiwal Board-New Scheme-2016-A)

Sol. Differences Between Isomorphic and Heteromorphic Generations:

Isomorphic Generation	Heteromorphic Generation
1. It is a type of alternation of generation in which sporophyte is morphologically similar to gametophyte. 2. It is found in Ulva.	1. It is a type of alternation of generation in which sporophyte is morphologically different to gametophyte. 2. It is found in seed plants.

46. Enlist methods of asexual reproduction. (Sahiwal Board-New Scheme-2017-A)

Sol. List of Methods of Asexual Reproduction: -

A. Natural: -
a. Fission
b. Budding
c. Regeneration
d. Apomixis
e. Parthenocarpy
f. Parthenogenesis

B. Artificial: -
a. Cloning
b. Tissue culture
c. Parthenocarpy

SECTION III
LONG QUESTIONS

1. Give an account of sexually transmitted diseases in man. (4)
(Lahore Board-Session- 2012-2014-Group-I-2014-A)
2. Describe female reproductive system in human. (4)
(Lahore Board-New Scheme-Group-I-2015-A)
3. Write a note on test tube babies and identical twins.(4)
(Lahore Board-New Scheme-Group-II-2016-A)
5. Discuss the process of birth in human female. (4)
(Lhr-I-18A, Bwp-15A, Sah-18A, DGK-II-10A, Grw-16A)
(Gujranwala Board-New Scheme-2014-A)
7. Explain four sexually transmitted diseases. (4)
(Gujranwala Board-New Scheme-2017-A)
8. What do you about Male Reproductive System of Humans? (4)
(Fsd-17A, Lhr-I-19A, Sah-16A, Bwp-19A)
(Multan Board-New Scheme-Group-II-2017-A)
9. Write notes on: (i) Seed Dormancy (4)
(ii) Fruit set and Fruit ripening
(Multan Board-New Scheme-Group-I-2018-A)
10. Write a note on "Fruit Set and Fruit Ripening". (4)
(Bahawalpur Board-New Scheme-2014-A)
11. Write a note on Fruit Set and Fruit Ripening. Also discuss Parthenocarpy in Plants. (4)
(Bahawalpur Board-New Scheme-2018-A)
14. Write a note on identical twins. (4)
(Faisalabad Board-New Scheme-2018-A)
15. Explain about "Seed Dormancy". (4)
(Rawalpindi Board-New Pattern-2014-A)
16. What are the functions of placenta during pregnancy? (4) (Rawalpindi Board-New Pattern-2015-A)
(Mtn-I-17A, DGK-II-16)
17. Define Parthenogenesis. Explain briefly different kinds of Parthenogenesis. (4)
(Sargodha Board-New Scheme-2014-A)
18. Give the comparison between Asexual and Sexual reproduction. (Sargodha Board-New Scheme-2017-A) (4)
20. What is parthenocarpy? How fruits ripened? (4)
(D.G.K. Board-New Course-Group-I-2015-A)
22. Define reproduction. Compare asexual reproduction with sexual reproduction. (4)
(Lhr-II-A, Ajk-17A, Rwp-19A)
(D.G.K. Board-New Course-Group-II-2018-A)
23. Describe human menstrual cycle. (4)
(Grw-19A, Sah-19A)
(Sahiwal Board-New Scheme-2015-A)

Chapter ---- 19

GROWTH AND DEVELOPMENT

1 MCQ

I) From Exercise:-

2) Neurula is the stage in which embryo has:
a) Blatocoel **b) Neural tube**
c) The germ layers d) Archenteron

3) The mesodermal cells do not invaginate but migrate medially and caudually from both sides and create a midline thickening called: (Lhr-I-16)
a) Henson's node **b) Primitive streak**
c) Epiblast d) Hypoblast

II) From Punjab Boards:-

1) Cleavage results in the formation of a rounded closely packed mass of blastomeres called:
(Lahore Board-Old Scheme-Group-II-2014-A)(Sgd-17A)
a) Morula b) Blastula
c) Gastrula d) Neurula

2) Which light enhances cell division and retard cell Enlargement? (DGK-II-18)
(Lahore Board-New Scheme-Group-II-2014-A)
a) Red b) Green
c) Blue d) Violet

3) The removal of apex releases the lateral buds from the apical dominance, it is called:
(Lahore Board-New Scheme-Group-I-2015-A)
a) Inhibitory effect **b) Compensatory effect**
c) Apical dominance d) Reproduction

4) The unspecialized cells present in flatworms and planaria are:
(Lahore Board-New Scheme-Group-II-2015-A)
a) Neoblast b) Osteoblast
c) Osteoclast d) Chondrocyte

5) **The individuals who born with abnormal organs or body parts is called:**
(Lahore Board-New Scheme-Group-II-2018)
a) Malformed b) Malignant
c) Falignant d) Malfunction

6) ***Acetabularia* is an/a:**
(Gujranwala Board-New Scheme-2014-A)
a) Epiphyte **b) Alga**
c) Fungus d) Angiosperm

7) **During elongation the cell volume increases upto:**
(Gujranwala Board-New Scheme-2015-A)(DGK-I-19)
a) 50 fold b) 100 fold
c) 150 fold d) 200 fold

8) **The condition in which an individual has a small is termed as:**
(Gujranwala Board-New Scheme-2016-A)
a) Harelip **b) Microcephaly**
c) Diabetes d) Epilepsy

9) **Gray vegetal cytoplasm gives rise to:**
(Gujranwala Board-New Scheme-2017-A)(DGK-II-14, I-19)
a) Larval epidermis b) Notochord
c) Muscle cells **d) Gut**

10) **A plant has a growth pattern called:**
(Gujranwala Board-New Scheme-2018-A)
a) Open growth b) Growing point
c) Meristem d) Apical

11) **The cavity formed between somatic and splanchnic mesoderm is: (Multan Board-New Scheme-2015-A) (Bwp-17)**
a) Archenteron b) Hensen's node
c) Coelom d) Neurocoel

12) **The pigment free area that appears at the time of fertilization is called:**
(Multan Board-New Scheme-2016-A)
a) Embryo b) Yolk
c) Gray crescent d) White cytoplasm

13) **The head can be regenerated in:**
(Multan Board-New Scheme-Group-I-2017-A)
a) Earthworm b) Frog
c) Leech d) Grasshopper

14) **The discoidal cap of cells above blatocoel is called:**
(Fsd-17A, Sah-18A)
(Multan Board-New Scheme-Group-II-2018-A)
a) Ectoderm b) Mesoderm
c) Endoderm **d) Blastoderm**

15) **Intercalary meristems are situated at:**
(Bahawalpur Board-New Scheme-2015-A)
a) Root Apex b) Shoot Apex
c) Base of Internode d) Top of Internode

16) **The chick embryo completes its development in:**
(Faisalabad Board-Old Scheme-2014-A)
a) 26 days b) 24 days
c) 21 days d) 20 days

17) **During gastrulation the blastoderm splits into two layers, an upper layer of cells is called:**
(Faisalabad Board-New Scheme-2014-A)
a) Hypoblast b) Area pellucida
c) Epiblast **d) Epiblast**

18) **Grey equatorial cytoplasm gives rise to:**
(Faisalabad Board-New Scheme-2016-A)
a) Notochord and neural tube
b) Muscle cells and guts
c) Skeleton and muscles
d) Gut and neural tube

19) **In which development stage, germ layers are formed: (Rawalpindi Board-New Pattern-2015-A)**
a) Morula b) Blastulation
c) Gastrulation d) Neurulation

20) **Immediately after fertilization, the egg undergoes a series of mitotic divisions called:**
(Rawalpindi Board-New Pattern-2016-A)
a) Morulla b) Gastrulation
c) Cleavage d) Blastula

21) **The neurula is the stage in which embryo has:**
(Rawalpindi Board-New Scheme-Group-II-2017-A)
a) Blastocoel b) The germ layers
c) Neural tube d) Archenteron

22) **Primary growth in plants is caused by:**
(Sargodha Board-New Scheme-2016-A)
a) Apical meristem **b) Lateral meristem**
c) Intercalary meristem d) Rib meristem

23) **Clear cytoplasm produces:**
(Sargodha Board-New Scheme-2018-A)
a) Larval epidermis b) Muscle cell
c) Gut d) Neural tub

24) **Which of the following sex chromosome abnormalities leads to tallness, aggressiveness and antisocial behavior?**
(D.G.K Board-New Scheme-Group-I-2015-A)
a) XYY b) XXY
c) XO d) XXXY

25) **The shell of chick egg is secreted as egg passes through:**
(D.G.K Board-New Scheme-Group-II-2015-A)(MTN-II-17)
a) Oviduct **b) Uterus**
c) Ovary d) Fallopian tube

26) **Clear cytoplasm produces:**
(D.G.K. Board-New Scheme-Group-I-2016-A)
a) Larval epidermis b) Gut
c) Muscle cell d) Neural tube

27) **Movement and rearrangement of the cells in the embryo is called:**
(D.G.K. Board-New Scheme-Group-II-2016-A)
a) Cleavage **b) Gastrulation**
c) Organogenesis d) Fertilization

28) **The branch of biology which deals with abnormal development is called: (Rwp-19A)**
(D.G.K. Board-New Scheme-Group-I-2017-A)
a) Teratology b) Palaentology
c) Gerontology d) Mythology

29) **Secondary growth leads to an increase in the diameter of the:**
(D.G.K. Board-New Scheme-Group-I-2018-A)
a) Stem b) Root
c) Leaf **d) Stem and Root**

30) Environmental factors causing abnormal development are grouped together as: (Sahiwal Board-New Scheme-2016-A)

a) Toxins b) Carcinogens
c) Mutagens **d) Teratogens**

31) Apical dominance is caused by: (Rwp-I-17, Bwp-18) (Sahiwal Board-New Scheme-2017-A)

a) Auxin b) Ethene
c) Cytokinin d) Gibbereline

III) From Entry Test:-

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

2. What is differentiation?

Sol. Differentiation: -

1. It is a developmental process by which relatively unspecialized cell undergoes a progressive change to a more specialized from or function.
2. A fertilized egg contains cytoplasmic components that are unequally distributed within the egg. These different cytoplasmic components are believed to have morphogenetic determinants that control functioning of a specific cell type. This is now called Differentiation.
3. In most cells, this process of differentiation is irreversible.

4. Differentiate between growth and development. (Lhr-I-16A, Grw-15A)

Sol. Differences Between Growth and Development: -

Growth	Development
1. Growth is an irreversible increase in the size of an organism. 2. It occurs as an organism matures. 3. It involves cell division and cell enlargement.	1. Development is a programmed series of stages from simple to more complex form. 2. It is a series of stages by which a zygote becomes an organism (also called embryonic development) or by which an organism changes during life span including puberty and aging (for example). 3. As it proceeds, cellular differentiation of structure and function takes place.

5. What is meristem? (Sgd-16A, Rwp-II-17A)

Sol. Meristem: -

1. Meristem is a specific area called growing point in higher vascular plants which consists of group of cells that are capable of division.
2. The cells of meristem which divide rapidly by mitosis are known as meristematic cells.
3. Dividing meristematic cells are typically young, small, with a dense cytoplasm, small or no vacuole and a large, active nucleus.
4. Each meristematic cell divides by mitosis and produces two daughter cells, one of which remains meristem and one differentiates into as a part of mature body of the plant.
5. These meristematic cells are located at the tips of stem and root. These are also present in the form of cylinders in the vascular bundles or between them and beneath the epidermis.
6. The entire plant body, in higher plants, is not capable of growing but growth is limited to these growing points or meristems.
7. The plant has the ability to grow its entire life because it possesses meristematic tissue.

II) From Punjab Boards:-

1. Differentiate between neurula and neurocoel. (Fsd-15A) (Lahore Board-New Scheme-Group-I-2015-A)

Sol. See Faisalabad Board Answer No: 2

2. Define apical and intercalary meristems. (Bwp-15A) (Lahore Board-New Scheme-Group-II-2015-A)

Sol. A) Apical Meristems: -

a. An apical meristem is an area of dividing tissue, located at the tip of shoot or root that gives rise to primary tissues.
b. It is responsible for increase in the number of cells at the tip of root or stem, so it plays important role in primary growth.
c. It is also responsible for the production of lateral appendages such as leaves and floral parts.

B) Intercalary Meristems: -

a. These are the parts of apical meristem which get separated from apex by permanent tissues.
b. They are situated at the bases of internodes in many plants.
c. They are of temporary nature.
d. They play important role in the production of leaves.
e. They also play an important role in the production of flower.

3. What is blastoderm? Name its layers. (Mtn-15A, Fsd-18A) (Lahore Board-New Scheme-Group-II-2015-A)

Sol. A) Blastoderm: -

It is a small disc of cells at the animal end of a reptile or bird embryo that results from early cleavages.

B) Names of Layers of Blastoderm: -

a. Epiblast b. Hypoblast

4. What is discoidal cleavage? (Grw-19A, Lhr-II-19A, Grw-15A, Rwp-I-17A, DGK-II-18A, Sah-14A) (Lahore Board-New Scheme-Group-II-2016-A)

Sol. Discoidal Cleavage: -

a. The type of cleavage that is confined to the small disc of protoplasm (called blasto disc) laying on the surface of the yolk at the animal pole is called Discoidal Cleavage.
b. It is incomplete cleavage which does not divide the yolk of the ovum.
c. It, however, divides the blastodisc completely.
d. The first two cleavage planes are verticle while the third runs horizontally parallel to the surface. The successive cleavages become irregular and number of cells increase.
e. Discoidal cleavage is found in bird's egg.

5. Differentiate between apical meristem and lateral meristem. (Rwp-15A)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Differences Between Apical Meristem and Lateral Meristem: -

Apical Meristem	Lateral Meristem
1. It is an area of dividing tissue that gives rise to primary tissue. 2. It is located at tip of the shoot or root. 3. It causes an increase in the length of the plant body.	1. It is an area of cell division that gives rise to secondatry tissues. 2. It extends along the entire length of the stem and root except at the tip and includes vascular cambium and cork cambium. 3. It causes an increase in the girth of the plant body.

6. Define growth.
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Growth: -

a. Growth is an irreversible increase in the size of an organism.
b. It occurs as an organism matures.
c. It involves cell division and cell enlargement.

7. What do you mean by lateral meristem? (DGK-II-15A)
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Lateral Meristem: -

a. Meristems are cylinders of dividing cells.
b. They are present in dicots and gymnosperms.
c. Vascular and cork cambium are examples of lateral meristems.
d. Some lateral meristems are determinate while others are indeterminate.
e. Determinate lateral meristems grow to certain size and then stop, such as leaves, flowers and fruits.
f. Indeterminate lateral meristems continually grow and replenish themselves remaining youthful, such as vegetative root and stem.
g. They play an important role in the increase of stem and root.

8. Differentiate between primary and secondary growth. (Sah-17A, Sah-19A, Bwp-18A, Mtn-II-18A, Lhr-II-19)
(Lahore Board-New Scheme-Group-I-2018-A)

Sol. Differences Between Primary and Secondary Growth: -

Primary Growth	Secondary Growth
1. It is an increase in the length of a plant. 2. It occurs due to the activity of apical meristems located at the tips of roots and shoots and also within the buds of stems. 3. It occurs in all plants.	1. It is an increase in girth (thickness) of a plant. 2. It occurs due to activity of lateral meristem i.e. vascular cambium and cork cambium located in the form of cylinders throughout the length of older stems and roots. 3. Only gymnosperms and woody dicots have secondary growth.

9. Define growth correlations.
(Sah-19A, Bwp-19A, Grw-14A, Mtn-I-18A, Fsd-14A)
(Lahore Board-New Scheme-Group-I-2018-A)

Sol. Growth Correlations: -

a. The development of a plant is usually correlated with its growth and different organs growing at different rates in different directions and development of different parts takes place. Such reciprocal relationship is known as Correlations or Growth Correlatins.
b. One of the most important growth correlative effect in plants is apical dominance, in which when apical bud grows, it suppresses the growth in lower auxillary (lateral) buds.

10. Define teratology and teratogens. (Bwp-14A)
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. A) Teratology: -
It is the branch of biology which deals with abnormal development and causes for such development.

B) Tertogens: -
Environmental factors causing or contributing to abnormal development are grouped together as teratogens.
Examples include radiation, certain chemicals, certain infectious agents, lethal mutations etc.

11. What are intercalary meristems? Give their role.
(Mtn-II-17A, Sgd-14A)
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. A) Intercalary Meristems: -

a. These are the parts of apical meristem which get separated from apex by permanent tissues.
b. They are situated at the bases of internodes in many plants.
c. They are of temporary nature.

B) Role of Intercalary Meristems: -

a. They play important role in the production of leaves.
b. They also play an important role in the production of flower.

12. Give affects of XYY Kliefelter syndrome.
(Gujranwala Board-New Scheme-2016-A)

Sol. Affects of XYY Kliefelter Syndrome: -
Affects of XYY Kliefelter Syndrome are:

a. Tallness
b. Aggressiveness
c. Mental defect and
d. Antisocial behavior

13. Define gray crescent. What role, it plays in development? (DGK-II-16A)
(Gujranwala Board-New Scheme-2017-A)

Sol. A) Gray Crescent: -
Gray crescent is the pigment free area that appears at the time of fertilization of ambhibian egg.

B) Role of Gray Crescent in Development: -
Gray crescent region is thaught to contain growth factors and other developmetal determinants and is required for the normal development of an amphibian.

14. Differentiate between area opeca and area pellucida.
(DGK-II-19, DGK-I-17A, DGK-I, II-18A)
(Gujranwala Board-New Scheme-2018-A)

Sol. Differences Between Area Opeca and Area Pellucida: -

Area Opeca	Area Pellucida
1. It is an area of marginal or peripheral cells of blastoderm. 2. This area lies unseparated from the yolk and forms the zone of junction. 3. No pool of fluid develops in this area. 4. It is a transparent area that transmits light.	1. It is an area of central cells of blastoderm. 2. It is an area which has been separated from yolk. 3. A pool of fluid develops under this area. 4. It is a truansluscent area.

15. What are neoblasts? Give their role.
(Grw-16A, Bwp-17A, Mtn-II-17A, DGK-II-14A, DGK-I-18A, Sah-14A, Lhr-19A)
(Gujranwala Board-New Scheme-2018-A)

Sol. Neoblasts are a large number of undifferentiated cells present in flatworms (e.g. Planaria) which can poroliferate and develop into any kind of tissue when animal requires to do so .

B) Role of Neoblasts: -
During regeneration they are mobalized and migrate to the site of amputation, where they differentiate into specialized cell types.

16. What is Apical Dominance?
(Mtn-16A, Bwp-15A, DGK-II-15A, I-16A, II-17A)
(Multan Board-New Scheme-2014-A)

Sol. Apical Dominance: -
a. Apical dominance is the inhibition of lateral buds by shoot tip.
b. Auxin produced by shoot apex plays an important role in apical dominance.

17. Discuss the role of Cytoplasm in development.
(Multan Board-New Scheme-Group-I-2017-A)
(Rwp-18A, Sgd-17A)

Sol. Role of Cytoplasm in Development: -
a. Cytoplasm plays an important role in differentiation. Cytoplasm of a fertilized egg has different cytoplasmic components that have morphological determinants controlling the functioning of a specific cell type called differentiation.
b. The fertilized egg of an ascidian, for example, contains cytoplasm of different colors segregated into different blastomeres:
i. Clear cytoplasm producing larval epidermis
ii. Yellow cytoplasm producing muscle cells
iii. Gray vegetal cytoplasm giving rise to gut
iv. Grey equatorial cytoplasm giving rise to notochord and neural tube.

18. Write practical applications of Apical dominance.
(Multan Board-New Scheme-Group-I-2018-A)

Sol. Practical Applications of Apical Dominance: -
a. It plays an important role in tap root development.
b. Application of auxins enhances apical dominance that prevents sprouting of lateral buds (eyes) in the potatoes increasing the storing period one to three years.

19. Write about cleavage and discoidal cleavage.
(Multan Board-New Scheme-Group-I-2018-A)

Sol. A) Cleavage: -
1. Cleavage is a series of mitotic cell divisons which the egg undergoes immediately after fertilization.
2. In cleavage, zygote undergoes a series of rapid mitotic divisions with no period of growth during each cell cycle.
3. Cleavage increases only the number of cells. It does not change the original volume of the egg cytoplasm, hence cells get smaller with each cell division.
4. In cleavage different daughter cells receive different regions of ovum's cytoplasm and hence, different regulatory signals.

B) Discoidal Cleavage: -
a. The type of cleavage that is confined to the small disc of protoplasm (called blasto disc) laying on the surface of the yolk at the animal pole is called Discoidal Cleavage.
b. It is incomplete cleavage which does not divide the yolk of the ovum.
c. It, however, divides the blastodisc completely.
d. The first two cleavage planes are verticle while the third runs horizontally parallel to the surface. The successive cleavages become irregular and number of cells increase.
e. Discoidal cleavage is found in bird's egg.

20. How Neural Plate is formed?
(Bahawalpur Board-New Scheme-2016-A)

Sol. How Neural Plate is Formed: -
On the dorsal surface of gastrula, over the notochord, presumptive neural ectoderm is present in the form of a band. As gastrula elongates, the band thickens to form a neural plate, a flat thickened area of ectoderm, in the chicks of 18 hours.

21. Differentiate between Determinate Growth and Inderminate Growth. (DGK-I-19A)
(Bahawalpur Board-New Scheme-2017-A)

Sol. Differences Between Determinate Growth and Indeterminate Growth: -

Determinate Growth	Indeterminate Growth
It is the growth in plants that stops once genetically predetermined structure has completely formed.	It is the growth in plants that is not terminated.

22. Define Regeneration. Give one example.
(Bahawalpur Board-New Scheme-2018-A)

Sol. A) Regeneration: -
The ability to regain or recover the lost or injured part of the body is called Regeneration.

B) One Example: -
Lizard can easily discard its tail but tail can be regenerated by special features of its tail.

23. Write two layers of lateral plate of mesoderms.
(Faisalabad Board-New Scheme-2015-A)

Sol. Two Layers of Lateral Plate of Mesoderms: -
Two layers of lateral plate of mesoderm are:

a. Somatic or Parietal Mesoderm: -
It is the outer layer which lies next to the ectoderm.

b. Splanchnic or Visceral Mesoderm: -
It is the inner layer which is in contact with endoderm.

24. What is meristem? Write function of lateral meristem.
(Faisalabad Board-New Scheme-2016-A)

Sol. A) Meristem: -
Meristem is a specific area called growing point in higher vascular plants which consists of group of cells that are capable of division.

B) Function of Lateral Meristem: -
Lateral meristem plays an important role in the increase in diameter of stem and root.

25. Name two layers of lateral plate of mesoderm.
(Faisalabad Board-New Scheme-2016-A)

Sol. Names Of Two Layers of Lateral Plate of Mesoderm: -
a. Somatic or Parietal Mesoderm
b. Splanchnic or Visceral Mesoderm

26. Differentiate between growth and embryonic development.
(Faisalabad Board-New Scheme-2017-A)

Sol. Differences Between Growth and Embryonic Development: -

Growth	Embryonic Development
1. It is the permanent and irreversible increase in size. 2. It occurs in embryo as well as in adult. 3. It increases the size of the embryo and adult.	1. It is a set of progressive changes which are undergone before an organism acquires its adult form. 2. It takes place only in the embryo. 3. It is a series of stages by which a zygote becomes an organism.

27. What are teratogens? Give an example.
(Faisalabad Board-New Scheme-2018-A)(Sah-15, SGD-18A)

Sol. A) Teratogens: -
Any agent capable of interfering with normal morphogenesis in an embryo leading to abnormal development is called Teratogen.

B) An Example: -
Ionization radiations (e.g. x-rays) affecting developing ovum or spermazoan causing damage or changes in the gene (mutation) are well known for their teratogenic actions.

28. Define the terms Gastrocoel and Neurocoel.
(Rawalpindi Board-New Pattern-2014-A)

Sol. A) Gastrocoel: -
The cavity between yolk and the endoderm is called Gastrocoel.

B) Neurocoel: -.
The cavity enclosed in the central nervous system is called Neurocoel.

29. What happens during organogenesis?
(Rawalpindi Board-New Scheme-Group-II-2017-A)

Sol. Events During Organogenesis: -
During organogenesis, cells interact and differentiate, as a result of which body organs are formed.

30. Define morula stage of development.
(SGD-19A, DGK-II-17A)
(Sargodha Board-New Scheme-2017-A)

Sol. Morula Stage of Development: -
a. Morula is an early embryo consisting of solid ball of cells.
b. It is usually a 32 celled embryo.
c. Cells of the morula are called blstomeres.
d. In chick embryo, it consists of a disc shaped mass of cells two or more layers in thickness (blastoderm) laying close to the yolk. In the centre of the blastoderm, the cells are smaller and completely defined while those at periphery, are flattened and larger.
e. It continues to divide forming a blastula.

31. Differentiate maturation from differentiation.
(Sargodha Board-New Scheme-2018-A)

Sol. Maturation Different From Differentiation: -

Maturation	Differentiation
1. It is the second phase of multicellular plant growth. 2. During this growth phase, different types of cells attain their final size. 3. Some cells of plant tissues (e.g. fibers and tracheids), elongate while others(e.g. pith, cortex etc.) do not.	1. It is the third phase of multicellular plant growth. 2. During this growth phase, the walls of many kinds of cells become thick and pitted. 3. Cells of various tissues differ in spatial dimensions and many new structural features develop.

32. Enlist types of cytoplasm on the basis of colors in fertilized egg of an Ascidian.
(D.G.K. Board-New Scheme-Group-I-2014-A)

Sol. Types of Cytoplasm On the basis of Colors in Fertilized Egg of an Ascidian: -
a. **Clear cytoplasm** producing larval epidermis
b. **Yellow cytoplasm** giving rise to muscle cells
c. **Gray vegetal cytoplasm** giving rise to gut
d. **Grey equatorial cytoplasm** producing notochord and neural tube.

33. Enlist the key events in animal's development.
(D.G.K. Board-New Scheme-Group-I-2015-A)

Sol. List of the Key Events in Animal's Development: -
a. **Gamete Formation** ---- Sperm and egg formation
b. **Fertilization** ----- Egg and sperm fuse to form zygote
c. **Cleavage** ----- Zygote divides, blastomeres are formed
d. **Gastrulation** ----- Germ layers are formed
e. **Organogenesis** ---- Body organs formed, cells interact and differentiate
f. **Growth** ----- Organs increase in size, adult body form attained

34. Compare epiblast and hypoblast in Gastrulation stage of Development.
(D.G.K. Board-New Scheme-Group-I-2015-A)

Sol. Comparison of Epiblast and Hypoblast in Gastrulation Stage of Development: -

Epiblast	Hypoblast
1. It is upper layer cells of blasoderm in blastula. 2. It is mainly presumptive ectoderm and mesoderm.	1. It is the lower layer of cells of blastoderm in blastula. 2. It is mainly presumptive endoderm.

35. What is Coelom?
(D.G.K. Board-New Scheme-Group-I-2016-A)

Sol. Coelom: -

a. Coelom is a fluid filled space developed entirely within the mesoderm between the body wall and digestive tube.
b. It is surrounded by a layer of epithelial cells entirely derived from mesoderm.
c. It is formed either by splitting of mesoderm or by an evagination of the embryonic gut or archenteron.

36. Define apical meristems.
(D.G.K. Board-New Scheme-Group-II-2017-A)

Sol. Names of the Phases of Plants Growth: -

a. Cell division
b. Elongation
c. Maturation
d. Differentiation

37. What is compensatory effect in plant growth?
(Sahiwal Board-New Scheme-2017-A)

Sol. Compensatory Effect in Plant Growth: -

a. In compensatory effect, growth of lateral buds is released from apical dominance.
b. It occurs due to removal of apex or applying of cytokinin on lateral buds.

38. Differentiate between inhibitory and compensatory effects.
(Sahiwal Board-New Scheme-2018-A)(DGK-I-17A)

Sol. Differences Between Inhibitory and Compensatory Effects: -

Inhibitory Effect	Compensatory Effect
1. In inhibitory effect, growth of lateral (buds) shoots is inhibited. 2. It occurs due to the release of auxin from the apical bud which reaches to lateral bud by diffusion.	1. In compensatory effect, growth of lateral buds is released from apical dominance. 2. It occurs due to removal of apex or applying of cytokinin on lateral buds.

39. Differentiate between Neurocoel and Nurulation.
(Azad Jammuu Kasmir Board -2017-A)

Sol. Differences Between Neurocoel and Nurulation: -

Nurulation	Neurocoel
Nurulation refers to the folding process in vertebrate embryos, which includes the transformation of the neural plate into neural tube.	It is the cavity enclosed in central nervous system.

SECTION III

LONG QUESTIONS

1. Discuss different phases of plants growth. (4)
(Lahore Board-Session- 2012-2014-Group-II-2014-A)
4. Explain briefly role of nucleus in development. (4)
(DGK-I-14, Rwp-17, 18A, Sah-17A, Lhr-I-17A, Bwp-15A)
(Gujranwala Board-New Scheme-2016-A)
5. Define and explain growth correlation. (4)
(Lhr-I-18A, Fsd-18A, Mtn-II-17A)
(Gujranwala Board-New Scheme-2017-A)
6. Write a note on Abnormal Development. (4)
(Sah-16, 18A, Rwp-II-17A, DGK-II-15, 16A, Lhr-14, Mtn-II-18A, Bwp-14A)
(Multan Board (New Scheme) (2014-A)
7. Write a note on Regeneration. (4)
(Multan Board-New Scheme-2016-A)(Lhr-II-18A)
9. What is growth? Discuss different phases of growth.(4)
(Fsd-17A, DGK-II-19A)
(Rawalpindi Board-New Pattern-2016-A)
10. What is Regeneration? Explain it with the help of examples in different groups of Animals. (4)
(DGK-II-14A, DGK-II-19A, Grw-19A)
(Sargodha Board-New Scheme-2017-A)
11. Describe the process of gastrulation in chick. (4)
(Rwp-19A, Bwp-19A)
(Sargodha Board-New Scheme-2018-A)
12. How abnormal development occurs in different individuals? (4)
(D.G.K. Board-New Course-Group-II-2017-A)
13. What is Differentiation? Give the five stages of differentiation in plants. (4)
(Sah-15A)
(D.G.K. Board-New Course-Group-I-2018-A)
14. Describe various types of Meristems. (4)
(Azad and Jammu Kashmir Board-2017-A)(DGK-I-19A)

C h a p t e r ---- 20

CHROMOSOMES AND DNA

1 MCQ

I) From Exercise:-

1) m RNA is synthesized by:
a) DNA polymerase **b) RNA Polymerase**
c) RNA ligase d) None of the above

2) Which of the following are non-sense codons?
(Bwp-18A)
a) AUG **b) UAA**
c) CUA d) All of above

3) Enzymes are responsible for assembly of:
a) Nucleic acid b) Protein
c) Carbohydrates **d) All a, b, c**

4) In bacteria the newly synthesized m RNA is released in: (Dgk-I-17A)
a) Nucleus **b) Cytoplasm**
c) Mitochondria d) Both a and c

II) From Punjab Boards:-

1) **Morphological characteristics of chromosomes are collectively called: (Lhr-I-19A, Sah-19A) (DGK-II-14, I-15, I-16, AJK-17, Sah-16, Rwp-18) (Lahore Board-New Scheme-Group-I-2014-A)**
a) Holotype b) Karyokinesis
c) Karyotype d) Neotype

2) **X-ray diffraction analysis of DNA was performed by: (Lahore Board-New Scheme-Group-I-2014-A)**
a) Erwin Chargaff b) Watson and Crick
c) Rosalind Franklin d) Charles Darwin

3) **Which one of the following is initiation codon? (Lahore Board-New Scheme-Group-II-2014-A) (Bwp-17A, Sah-19)**
a) AUG b) GUA
c) UGA d) GAC

4) **DNA polymerase only adds nucleotides to the end: (Lahore Board-New Scheme-Group-I-2017-A)**
a) 5′ end **b) 3′ end**
c) 2′ end d) 4′ end

5) **A chromosome with equal length of its items: (Lahore Board-New Scheme-Group-II-2018)(Mtn-14A)**
a) Acrocentric b) Telocentric
b) Metacentric d) Sub metacentric

6) **Repeating units of DNA are called: (Gujranwala Board-New Scheme-2014- A)**
a) Histones b) Nucleosides
c) Nucleotides d) Amino acids

7) **Unlike most proteins, histones are ---------- (Gujranwala Board-New Scheme-2015- A)**
a) Positively charged b) Negatively charged
c) Neutral d) Discharged

8) **m RNA is synthesized by: (Gujranwala Board-New Scheme-2016- A)**
a) DNA polymerase b) DNA ligase
c) RNA polymerase d) Endonuclease

9) **Highly condensed portions of chromosomes are called: (Gujranwala Board-New Scheme-2018- A) (Mtn-14A)**
a) Euchromatin **b) Heterochromatin**
c) Supercoils d) Centromeres

10) **Chromosomal part which uncoils, during inter phase is called: (Multan Board-New Scheme-2016-A)**
a) Euchromatin b) Heterochromatin
c) Chromatids d) Satellite DNA

11) **The scientist who suggested that the information encoded within the DNA of chromosomes acts to specify particular enzymes was: (Multan Board-New Scheme-Group-I-2017-A)**
a) Griffth **b) Garrod**
c) Graham d) Ghosi

12) **Erwin Chargaff showed that the amount of guanine is always equal to: (Multan Board-New Scheme-Group-II-2017-A)**
a) Cytosine b) Thymine
c) Adenine d) Uracil

13) **In sickle anemia, code for glutamic acid is replaced by: (Multan Board-New Scheme-Group-I-2018-A)**
a) Leucine b) Histidine
c) Valine d) Proline

14) **A sequence of three nucleotides in mRNA is called: (Multan Board-New Scheme-Group-II-2018-A)**
a) Cistron **b) Codon**
c) Anticodon d) Template

15) **Which strand of DNA is transcribed? (Bahawalpur Board-New Scheme-2014-A)**
a) Coding b) Sense
c) Template d) Both Strands

16) **One of the given does not code for any amino acid. (Bahawalpur Board-New Scheme-2015-A)**
a) AUG b) ACU
c) GUA **d) UAA**

17) **V-shaped chromosomes are called: (Faisalabad Board-Old Scheme-2014-A)**
a) Metacentric b) Sub-metacentric
c) Telocentric d) Acrocentric

18) **Transfer of genetic material from one cell to another, which alter the genetic make up of recipient cell is called: (Faisalabad Board-New Scheme-2015-A)**
a) Transformation b) Translation
c) Transcription d) Transduction

19) **This condition appears as a result of point mutation. (Faisalabad Board-New Scheme-2016-A)**
a) Down syndrome b) Turner syndrome
c) Klinefelter syndrome **d) Sicle cell anemia**

20) **Each Okazaki fragment is synthesized by: (Faisalabad Board-New Scheme-2017-A)**
a) DNA polymerase I **b) DNA polymerase III**
c) DNA polymerase II d) DNA polymerase IV

21) **Human cell contains types tRNA molecules: (Rawalpindi Board –New Pattern-2014-A)(Sgd-17A)**
a) 20 **b) 45**
c) 95 d) 300

22) **The sequence of nucleotides that determines the amino acid sequence of a protein is called: (Rawalpindi Board-New Pattern-2015-A)**
a) Allele b) Multiple alleles
c) Chromosome **d) Gene**

23) **DNA was discovered in: (Rawalpindi Board-New Pattern-2016-A)**
a) 1869 b) 1864
c) 1961 d) 1971

24) **Number of histone protein molecules in a single nucleosome are: (Rawalpindi Board-New Scheme-Group-I-2017-A)**
a) 06 b) 09
c) 08 d) 10

25) **If the alterations involve only one or few base pairs in the coding sequence they are called: (Rawalpini Board-New Scheme-Group-II-2017-A)**
a) Mutation **b) Point mutation**
c) Deletion d) Inversion

26) Chromosomes appear inside the nuclease at the time of : (Sargodha Board-New Scheme-2016-A)
a) **Cell division** b) Cell elongation
c) Cell maturation d) Cell differentiation

27) Strand of DNA which is not transcribed is called as: (Sargodha Board-New Scheme-2018-A)
a) Template strand b) Antisense strand
c) **Coding strand** d) Lagging strand

28) Walther Fleming discovered Chromosomes in the dividing cells of: (Lhr-II-19) (D.G.K Board-Group-I-2014-A)
a) Frog larvae b) Sea urchin larvae
c) Insect larvae d) **Salamander larvae**

29) RNA polymerase II synthesizes: (D.G.K. Board-New Scheme-Group-II-2015-A)
a) **mRNA** b) tRNA
c) rRNA d) cDNA

30) In 1953, F. Sanger described the complete sequence of Amino Acids of: (D.G.K. Board-New Scheme-Group-II-2016-A)
a) Myoglobin b) Keratin
c) **Insulin** d) Globulin

31) A combination of three nucleotides of DNA that specifies an amino acid is called: (D.G.K. Board-New Scheme-Group-I-2018-A)
a) Cistron b) Anticodon
c) Entron d) **Genetic code**

32) Okazaki fragments are synthesized by: (D.G.K. Board-New Scheme-Group-II-2018-A)(Sgd-19A)
a) DNA ligase b) RNA polymerase
c) **DNA polymerase** d) Primase

33) Nucleosomes occur every: (Sahiwal Board-New Scheme-2014-A)(Sah-17A)
a) 50 nucleotides b) 100 nucleotides
c) 150 nucleotides d) **200 nucleotides**

34) Which of the following is non-sense codon? (Sahiwal Board-New Scheme-2015-A)
a) **UGA** b) UGG
c) AUG d) AUC

35) Every gene starts with initiation codon AUG which normally encodes the amino acid: (Sahiwal Board-New Scheme-2018-A)
a) Arginine b) Citruline
c) Lysine d) **Methionine**

36) Histones are positively charged due to abundance of the basic amino acid: (Azad Jammu Kashmir Board-2017-A)
a) Leucine b) Ornithine
c) Methionine d) **Arginine**

III) From Entry Test:-

1) In what direction can a DNA polymerase work when catalyzing the addition of nucleotide mononmers to build a strand of DNA? (Entry Test-2007)
a) **From the 5′ toward the 3′ end of the new strand being assembled**
b) From the 3′ to 5′ end of the strand being assembled
c) From replication centres in two directions called replication forks
d) In both directions if DNA ligase is present

3) The two strands in DNA are coiled --------- to each other: (Entry Test-2007)
a) Parallel c) Both a, b
b) **Antiparalle** d) None of these

4) The mutation which causes change in the sequence of DNA is called: (Entry Test-2013-2017)
a) **Point mutation** c) Deletion
b) Chromosomal mutation d) Inversion

5) Phenylketonuria is an example of: (Entry Test-2013)
a) Polyploidy c) Inversion
b) Transmutation d) **Point mutation**

6) Sickle cell anemia is a type of: (Entry Test-2014)
a) Insertion c) Deletion
b) Transposition d) **Base Substitution**

7) When X-rays are passed through crystalline DNA, it shows helix making one twist every: (Entry Test-2017)
a) 2 nm c) 34 nm
b) **3.4 nm** d) 4 nm

8) Following is the structure of: (Entry Test-2017)
a) Uracil c) Guanine
b) Thymine d) **Cytosine**

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. What are the major classes of RNA? (Lhr-II-15, 16A)

Sol. Major Classes of RNA:

a. Messenger RNA (mRNA): -

1. It is a single, uncoiled strand of RNA with exposed beses.
2. It is transcribed from DNA and passes from nucleus to ribosome.
3. During polypeptide synthesis, it brings information from chromosome to ribosome to direct the assembly of amino acids into a polypeptide chain.

b. Transfer RNA (tRNA): -

1. tRNA is relatively a small molecule consisting of 70-90 nucleotides.
2. Like other RNAs it is single stranded, but is folded back on itself in various places by complementary base pairing to form a complex three dimensional shape. When flattened out it resembles a clover leaf.
3. It has a triplet of nucleotides called an anticodon that can establish hydrogen bonds with the codon in mRNA.

4. It also has an amino acid attachment site at its 3′ hydroxyl end.
5. tRNA brings the correct amino acid to the codon during protein synthesis.

c. Ribosomal RNA (rRNA): -

1. Ribosomal RNA (rRNA) is the class of RNA found in ribosome.
2. It is in globular form and is an integral part of the structure of ribosomes.
3. During translation, rRNA provides the sites where polypeptides are assembled.

2. What is the function RNA polymerase in transcription?
(Sah-17A, Lhr-II-14A, Rwp-19A, Grw-19A)

Sol. Function RNA Polymerase in Transcription: -
Using DNA as template, RNA polymerase catalyses the linking together of four ribonucleotides to form RNA. It copies the base sequence of one of the DNA strands (called coding strand).

3. How did Crick and his colleagues determine how many nucleotides are used to speify eah amino acids?

Sol. How did Crick and His Colleagues Determine How Many Nucleotides are Used to Specify Each Amino Acid: -
Crick and his colleagues tested all 64 condons (each comprising three nucleotides) by making artificial mRNA and triplet codons and using them to synthesize a protein a or amino-acyl-tRNA complexes in cell free systems.

4. What is anticodon?

Sol. Anticodon: -
It is the sequence of three unpaired bases at one point on tRNA which is complementary to a codon on mRNA and can combine with it by complementary base pairing.

II) From Punjab Boards:-

1. What is translation? (Bwp-14A, Rwp-18A, Sah-17A) (Lahore Board-New Scheme-Group-I-2014-A)

Sol. Translation: -

a. Translation is a process in which nucleotide-sequence information in mRNA is translated into amino acid sequence informion in polypeptide chain.
b. It is the second step of central dogma.
c. It is an enzymatic process which requires three major components, mRNA, ribosomes and tRNA.
d. In translation, ribosomes bind to and move along mRNA to read the nucleotide sequence and convert it into a sequence of amino acids in polypeptide chain, amino acids being carried to mRNA and ribosome by tRNAs.

2. Define point mutation. (Lhr-II-18A, Grw-14A, 16A, Bwp-18A, Rwp-16A) (Lahore Board-New Scheme-Group-I-2014-A)

Sol. Point Mutation: -

a. Point mutation is an alteration of one or few nucleotides in a chromosomal DNA molecule.
b. It is a mutational change that affects the message itself, producing alteration in the sequence of DNA nucleotide.
c. It involves alteration of only one or a few bases in the coding sequence.
d. A point mutation arises when a base (of a nucleotide) is substituted, added, or deleted during the replication process.
e. It is also known as gene mutation.
f. Mutations may arise for two reasons:
i. Some are spontaneous, meaning that they arise without any apparent external cause, usually due to pairing errors occurring during DNA replication.
ii. Most are induced by external agents called mutagens. There are three classes of mutagen: radiation, chemicals, and viruses.
Examples: -
Sickle Cell Anemia and Phenylalkatunaria

3. Define karyotype.
(Bwp-15A, Rwp-II-17A, DGK-I-14A) (Lahore Board-New Scheme-Group-I-2014-A)

Sol. Karyotype: -

a. The particular array of chromosomes that an individual possesses is called its karyotype.
b. Karyotype may differ greatly between different species, or sometimes even between particular individuals.
c. Karyotypes of individuals are often examined to detect genetic abnormalities, such as those arising from extra or lost chromosomes.
(Note: - The term karyotype is given to whole group of characteristics that allows the particular chromosomal set (or particular array of chromosome), that is, the number of chromosomes, relative size, position of centromere, length of the arms, secondary constriction and the satellites.)

4. What is genetic code? (Grw-15A, Rwp-16A) (Lahore Board-New Scheme-Group-II-2014-A)

Sol. Genetic Code: -

1. Genetic code is the combination of three nucleotides which specify a particular amino acid.
2. The basic unit of genetic code is codon which is sequence of three adjacent nucleotides in DNA or mRNA that code for one amino acid.
3. Genetic code has several features:

a. Each codon corresponds to only one amino acid. **For example**, the triplet GAC represents or stands for the amino acid glutamic acid GUG represents valine.
b. There are several codons for most amino acids. **For example**, there are six codons for serine, four for glycine and two for lysine.
c. Three codons act as stop signals, meaning end of message.
d. One codon acts both as start and code for the amino acid methionine.
e. The genetic code is universal. It is the same in almost all the organisms. But the study of code of mitochondrial DNA however, showed that genetic code is not that universal.

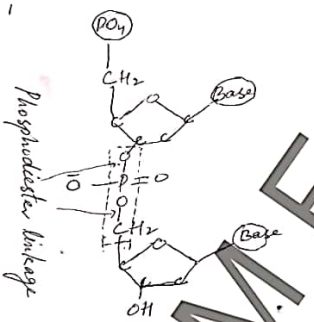
5. Compare euchromatin with heterochromatin.
(LahoreBoard-New Scheme-Group-II-2014-A, 2016-I-18A)

Sol. Comparison of Euchromatin With Heterochromatin:

Euchromatin	Heterochromatin
1. Euchromatin is condensed during cell division and is present in an open configuration at all other times 2. It is generally capable of transcription, hence its gens can be expressed. 3. It is loosely packed chromatin structure. 4. It is lightly staining.	1. The regions of heterochromatin remain tightly coiled and bound to chromosome proteins through the cell cycle even during interphase. 2. It is not available for transcription, hence its genes are never expressed. 3. It is highly coiled and condensed chromatin. 4. It is densely staining.

6. Sketch a phosphodiester bond. (Mtn-I-17A, Fsd-16)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Sketch of a Phosphodiester Bond: -



7. Define central dogma.
(Mtn-I-17A, Fsd-16, Sgd-16A, DGK-II-15A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Central Dogma: -

a. Central dogma is the flow of biological information that is from DNA, the carrier of genetic information, to RNA to protein.
b. Central dogma was first articulated by Crick.
c. There are following two steps of central dogma.

a. Transcription: -
The first step of central dogma is the transfer of information from DNA to RNA, which occurs when an mRNA copy of the gene is produced. The process is called **Transcription**.

b. Translation: -
The second step of central dogma is the transfer of information from RNA to proteins, which occurs when the information contained in the mRNA is used to direct the synthesis of polypeptides by ribosomes. This process is called **translation**, because the nucleotide sequence of the mRNA is translated into an amino acid sequence in the polypeptide.

8. What is semi-conservative replication? (DGK-II-15A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Semi-Conservative Replication: -

a. In semi-conservative replication (model) of DNA, the sequence of original duplex is conserved, the duplex itself not. Instead each strand of the duplex becomes part of another duplex.
b. Watson and Crick suggested in 1953, that during DNA replication, each strand of DNA acts as a template for the synthesis of a complementary strand. In this way, DNA replication produces two daughter DNA duplexes, each of which contains one parental strand and one newly synthesized strand. This mode of replication is termed semi-conservative replication.

9. Differentiate between transcription and translation.
(SGD-15A, Grw-15A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Differences Between Transcription and Translation: -

Transcription	Replication
1. It is the process by which RNA is synthesized from a DNA template. 2. RNA polymerase enzyme catalyzes transcription.	1. It is the process by which DNA is duplicated. 2. DNA polymerase catalyzes replication.

10. Define Euchromatin.
(Lahore Board-New Scheme-Group-I-2016-A)

Sol. Euchromatin: -

a. Euchromatin is defined as those regions of chromosomes which are usually present in an open configuration and are condensed only during cell division when compact packaging facilitates the movement of chromosomes.
b. Euchromatin is less densely packaged than heterochromatin.
c. It is metabolically active with regard to RNA synthesis, hence its genes can be expressed.
d. Euchromatin is lightly staining.

11. What is transformation? (Fsd-15A, Sah-18A)
(Lahore Board-New Scheme-Group-I-2016-A)

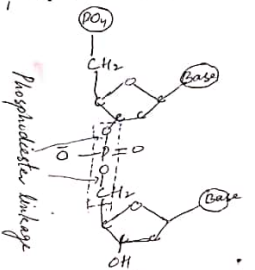
Sol. Transformation: -

a. Transformation is the transfer of genetic material from one cell to another and can alter the genetic make up of the recipient cell.
b. Transformation was first observed by Griffith in 1928 when DNA of heat killed S-type bacteria changed the live DNA of R-type bacteria into live S-type DNA and then live S-type bacteria in his last experiment.
(Note: - The term transformation is used in following related meanings.
a. It is the process of transmitting genetic information from one bacterium to another bacterium through environment causing it to transform (undergo changes). This principle was first notified by Fred Griffith in 1928.

b. It is the conversion of normal cultured cells into cancerous cells. It is usually produced by certain viruses that can cause the cancerous transformation of normal cells in cultures.
c. It is the process of introducing a recombinant DNA molecule (insert DNA and vector together) into a compatible host cell. This method is applied in biotechnology.)

12. Sketch phosphodiester bond.
(Lahore Board-New Scheme-Group-I-2016-A)

Sol. Sketch of Phosphodiester Bond: -



13. What are Okazaki fragments?
(Sgd-16A,DGK-II-15A, Grw-17A, Fsd-17A)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Okazaki Fragments: -

a. These are short fragments of DNA produced by discontinuous replication, elongating in the 5′-3′ direction away from the replication fork.
b. Each Okazaki fragment is synthesized by DNA polymerase III in 5′—3′ direction, beginning at the replication fork and moving away from it.
c. Each okazaki fragment begins with a RNA primer.
d. Many okazaki fragments are joined by DNA ligase to form lagging strand.
e. Okazaki fragments are 200 nucleotides in eukaryotes and 1000-2000 in prokaryotes.

14. What is sickle cell anemia? (Grw-14A)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Sickle Cell Anemia: -

a. It is an inherited form of anemia in which there is abnormality in the hemoglobin beta chains.
b. In sickle cell anemia, defective hemoglobin molecules cause red blood cells to distort when subjected to low oxygen concentration, reducing its ability to carry oxygen.
c. Sickle cell hemoglobin molecule differs from normal hemoglobin by only one amino acid. It contains glutamic acid instead of valine.
d. The critical change in the sickle cell disease is a mutation that replaces a single thymine with an adenine at the position that codes for glutamic acid converting the position to valine.
e. The normal DNA contains CTT triplet that specifies glutamic acid, while the DNA of sickle cell hemoglobin contains CAT which specifies valine.

15. What do you mean by mutation?
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Mutation: -

1. Mutation is the changes in the chromosome structure or chromosome number or changes in the DNA of gene.
2. Mutations can broadly be classified as:

a. Chromosomal Aberration ---- Megachanges which involve presence of extra chromosome or loss of a chromosome from the diploid number of chromosomes, or changes like deletion, insertion, inversion etc in the parts of the chromosome.
b. Point Mutation ---- Structural changes in the DNA of gene, usually changes in one or few baise pairs of nuclotides including deletion, substitution, insertion, addition etc. that affect the message itself.

16. Define nucleotide and nucleoside.
(Mtn-15A, 16A, II-17-18A, Fsd-14, 15, 18A, Rwp-15A, I-17A, II-17A Sah-14A, Sgd-16A, DgK-I-14A, II-15A)
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. A) Nucleotide: -
Nucleotide is a building unit of DNA or RNA, consisting of a pentose sugar (deoxyribose or ribose), phosphate and base.
B) Nucleoside: -
Nucleoside is an organic molecule consisting of a purine or pyrimidine base linked to ribose or deoxyribose and is derived by hydrolysis of nucleic acids or nucleotides.

17. What are mutagens? Give one example. (DGK-II-18A)
(Lahore Board-New Scheme-Group-I-2018-A)

Sol. A) Mutagens: -
a. An agent that induces changes in the DNA (mutations) is called mutagen.
b. Since cancer is a result of somatic mutations, mutagens are also carcinogenic (cancer-producing agents).
c. There are three classes of mutagen: Radiation, Chemical and Viruses.

B) An Example of Mutagen: -
Nitrous acid (a chemical mutagen) changes cytocine into uracil, which pair with adenine rather than guanine. The end result is to convert a C—G pair into an A—T pair.

18. Where codon and anticodon are situated? (Grw-17A)
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. A) Situation of Codon: -
DNA or mRNA
B) Situation of Anticodon: -
tRNA

19. Differentiate between chromosome and nucleosome.
(Gujranwala Board-New Scheme-2015-A)

Sol. Differences Between Chromosome and Nucleosome: -

Chromosome	Nucleosome
1. Chromosome is a thread like vehicle of hereditary information that is physically transmitted from one generation to the next.	1. Nucleosome is a fundamental packaging unit of eukaryotic chromosome. It is absent in prokaryotic chromosome.

2. In eukaryotes, each chromosome consists of a single linear DNA molecule and the associated proteins, while in prokaryotes, the chromosome consists of a single nacked circle of DNA.	2. Each nucleosome is a complex of DNA and histone proteins in which the double helical DNA winds around eight molecules of histone.

20. How is translation terminated?
(Gujranwala Board-New Scheme-2016-A)

Sol. Termination of Translation: -
Translation is terminated when non-sense codon (for example, UAA) is exposed on mRNA. Non-sense codons do not bind to tRNA, but they are recognized by release factors, proteins that release the newly made polypeptide from the ribosomes.

21. Define semiconservative and conservative replication.
(Gujranwala Board-New Scheme-2016-A)(DGK-II-18A)

Sol. A) Semiconservative Replication: -
According this method of replication, each strand of duplex DNA acts as a template for syntheszing a daughter strand. Each daughter molecule of DNA contains one parental strand and one newly synthesized daughter strand.

B) Conservative Replication: -
According to this method of replication, parental double helix would remain intact and generate DNA copies consisting of entirely new molecules.

22. Briefly describe alkaptonuria disease.
(Mtn-14A, Bwp-17A, Sah-18A, DGK-II-16, DGK-I-19A, Grw-19A)
(Gujranwala Board-New Scheme-2017-A)

Sol. Alkaptonuria Disease: -
a. It is also known as black urine disease.
b. It is a condition in which the urine contains homogentesic acid, which turns black on exposure to air.
c. It is a hereditary disease which is caused by a recessive allele. In this disease an enzyme necessary for breakdown (catabolism) of homogentesic acid is lacking.

23. Define phenylketonuria.
(Grw-19A, Mtn-I-18A, Fsd-18A)
(Gujranwala Board-New Scheme-2018-A)

Sol. Phenylketonuria: -
Phenylketonuria is a disorder caused by point mutation in which an enzyme (phenylalalnine hydroxylase) necessary for breakdown of phenylalanine is lacking. Phenylalanine accumulates in the blood stream of infant and interferes with the development of brain cells. Infants with phenylketonuria suffer severe mental retardation, and affected individuals rarely live more than 30 years.

24. Enlist non-sense codon. Give their function.
(Gujranwala Board-New Scheme-2018-A)

Sol. A) List of Non-Sense Codon: -
UAA, UAG and UGA.

B) Function of Non-Sense Codons: -
UAA, UAG and UGA cause termination of translation (ending polypeptide chain synthesis).

25. Differentiate between Pyrimidines and Purines.
(Multan Board-New Scheme-2014-A)(Sah-17A, Mtn-I-17A)

Sol. Differences Between Pyrimidines and Purines: -

Purines	Pyrimidines
1. Purines have five membered plus six membered nitrogen containing rings that are stuck together. 2. Purine catabolism, or breakdown is uric acid. **Examples: -** Adenine and Guaninine.	1. Pyrimidines have a six membered nitrogen containing ring. 2. Pyrimidine catabolism, or breakdown is ammonia, carbon dioxide and beta amino acids. **Examples: -** Uracil, Thymine and Cytosine

26. Differentiate between codon and anticodon.
(Multan Board-New Scheme-2014-A)
(Lhr-II-19A, Sgd-19A, DGK-II-14A, Grw-17A)

Sol. Differences Between Codon and Anticodon: -

Codon	Anticodon
It is the sequence of three bases in mRNA which specifies an amino acid.	It is the sequence of three bases in tRNA complementary to an mRNA codon.

27. Differentiate between Template and Coding Strand.
(DGK-II-19, II-17A, I-15, 16A, Bwp18A, Sah-15A)
(Multan Board-New Scheme-2015-A)

Sol. Differences Between Template and Coding Strand:

Template Strand	Coding Strand
1. It is the strand of DNA that is transcribed. 2. It is the strand of DNA on which RNA transcript is formed. 3. It is also known as antisense (-) strand.	1. It is the strand of DNA that is not transcribed. 2. Coding strand has the same sequence as the RNA transcript, except T takes the place of U. Hence, it is the strand which is actually copied and is complementary to the template strand of DNA. 3. It is also known as the sense (+)strand.

28. Draw formula of Cytosine.
(Multan Board-New Scheme-2016-A)

Sol. Formula of Cytosine: -

29. What is Promoter? (Rwp-16A, Sgd-14A, Lhr-I-19A)
(Multan Board-New Scheme-Group-II-2017-A)

Sol. Promoter: -
a. It is the nucleotide sequence in DNA template strand to which RNA polymerase attachs to begin ranscription.
b. In prokaryotes, within promoters there are two binding sitesTTGACA also called -35 sequence also called -35 sequence and TATAAT sequence also called -10 sequence which have affinity for the RNA polymerase. In eukaryotes these sites are at -75 and –25 sites respectively.
c. Promoter is located at the upstream of the gene.
d. Promoter sequence is not copied.

30. Write the functions of DNA polymerase III.
(Multan Board-New Scheme-Group-I-2018-A)(Lhr-I-19A)

Sol. Functions of DNA Polymerase III: -

It is the major enzyme responsible for DNA replication. It synthesizes leading strand as well as Okazaki frogments in the lagging strand.

31. Define Nucleosome. (Sgd-17A, DGK-I-18A, Sah-15, 16, 18, Bwp-16A, Fsd-14A, Rwp-14A)
(Multan Board-New Scheme-Group-II-2018-A)

Sol. Nucleosome: -

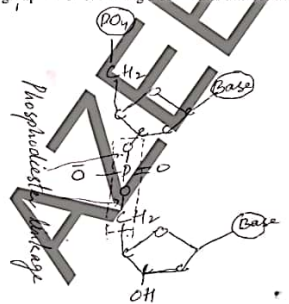
a. The nucleosome is a fundamental packaging unit of eukaryotic chromosome and is a bead like structure of 10 nm in diameter.
b. Many nucleosomes are linked to one another by linker DNA to form chromatin. Hence chromatin is composed of long sequences of nucleosomes, each separated by 200 nucleotides and resembles a string of beads.
c. A nucleosome is a complex of DNA and histone proteins in which double helical DNA (or DNA duplex) winds twice around eight molecules of histone.
d. In a nucleosome, histones are positively charged while the phosphate groups of DNA are negatively charged. Hence the histone core acts as magnetic form that promotes and guides the coiling of DNA.

(Note: - Although nucleosome was originally defined as a bead plus a DNA segment that links it to an adjacent nucleosome, today the term more commonly refers only to bead itself ,that is, the eight histones and the DNA wrapped around them).

32. What is Phosphodiester bond?
(Grw-18A, Bwp-17A, Mtn-15A, Bwp-15A, Sgd-18A)
(Multan Board-New Scheme-Group-II-2018-A)

Sol. Phosphodiester Bond: -

a. It is a covalent linkage between two nucleotides in a strand of DNA or RNA.
b. It includes a phosphate group bonded to the sugars of two adjacent nucleotides by two ester (P-O-C) bonds, one between phosphate group and 5′ OH of sugar of same nucleotide and the second between phosphate group and 3′ OH of sugar of another nucleotide.



33. Differentiate between Leading and Lagging Strand.
(Bahawalpur Board-New Scheme-2014-A)(Sgd-19A)

Sol. Differences Between Leading and Lagging Strand:

Leading Strand	Lagging Strand
1. It elongates towards the replication fork. 2. It is synthesized continuously in 5′--3′ direction. 3. It requires only one RNA primer for its initiation.	1. It elongates away from the replication fork. 2. It is synthesized discontinuously in a series of short segments (Okazaki fragments) in 5′--3′ direction. 3. It requires many RNA primers, one for each Okazaki fragment.

34. Define Gene and Genome.
(Bahawalpur Board-New Scheme-2015-A)

Sol. A) Gene: -

a. The sequence of nucleotides that determines the amino acid sequence of a protein is called a gene.
b. It is the unit of hereditary.
c. It carries the information needed to produce a specific RNA.
d. It has also information needed to code for a polypeptide (a potential product).

B) Genome: -

Genome is the entire DNA sequence of an organism.

Or

A genome is a full set of genes of an individual.

35. Enlist Initiation codon and Non-sense codons.
(Bahawalpur Board-New Scheme-2016-A)

Sol. A) Initiation Codon: -

AUG

B) List of Non-Sense Codons: -

a. UAA
b. UAG
c. UGA

36. What is Semi-Conservative Model of DNA?
(Bahawalpur Board-New Scheme-2018-A)
(Rwp-I-17A, DGK-I-15A)

Sol. Semi-Conservative Model of DNA: -

a. In semi-conservative replication (model) of DNA, the sequence of original duplex is conserved, the duplex itself not. Instead each strand of the duplex becomes part of another duplex.
b. Watson and Crick suggested in 1953, that during DNA replication, each strand of DNA acts as a template for the synthesis of a complementary strand. In this way, DNA replication produces two daughter DNA duplexes, each of which contains one parental strand and one newly synthesized strand. This mode of replication is termed semi-conservative replication.

37. How mRNA in eukaryotic cell remain protected from nucleases and phosphatases?
(Faisalabad Board-New Scheme-2014-A)

Sol. Protection of Eukaryotic mRNA: -

mRNA in eukaryotic cell is remain protected by a cap and a tail.

A. Cap: -

a. A cap is added to first nucleotide transcribed by RNA polymerase.

b. The linkage of cap to mRNA is different, because the riboses of 7 methyl-guanosine and the terminal nucleotide of mRNA are linked by a 5′ to 5′ triphosphate bridge.
c. The cap has no free phosphates, and thus protected against attack by phosphatases and other nucleases.

B. Tail: -

a. A sequence of polyadenylic acid (AAAA……) called poly A tail is attached to 3′ end of mRNA.
b. This poly A segment is 100 to 200 nucleotides long.
c. Poly A tail has a role in promoting mRNA stability.

38. What is one-gene-one enzyme hypothesis?
(Faisalabad Board-New Scheme-2015-A)
(Bwp-14A, DGK-II-16A)

Sol. One-Gene-One Enzyme Hypothesis: -
One gene one enzyme hypothesis states that genes produce their effect by specifying the structure of the enzymes and each gene encodes the structure of single enzyme.

39. Define chromosomal aberrations.
(Faisalabad Board-New Scheme-2016-A)(DGK-I-16A, 17A)

Sol. Chromosomal Aberrations: -

A. Chromosomal aberrations are mega changes such as:
a. Presence of a an extra chromosome or loss of a chromosome from the diploid number of chromosomes.
b. Visible changes in the parts of the chromosomes, like deletion, insertion, invertion etc.

B. Chromosomal aberrations lead to syndromes like Down's syndrome, Klinefelter's syndrome etc.

40. Define transcription. (Rwp-14A, Bwp19A)
(Faisalabad Board-New Scheme-2017-A)

Sol. Transcription: -

1. It is the enzymatic synthesis of an RNA molecule whose sequence is complementary to the sequence of one strand of a segment of DNA.
2. It takes place in the nucleus of the cell.
3. It is first step of gene expression (central dogma).
4. RNA is synthesized from DNA.
5. Ribonucleoside triphosphates, DNA and an enzyme RNA polymerase are required for transcription.
6. Promotor site is required for the initiation of transcription.
7. GC hairpin causes RNA polymerase to stop transcription.

41. Write contribution of Rosalin Franklin.
(Rawalpindi Board-New Pattern-2015-A)

Sol. Contribution of Rosalin Franklin: -
Rosalin Franklin provided X-ray diffraction data of DNA, suggesting DNA molecule a shape of a helix with a diameter of 2 nm and a complete helical turn every 3.4 nm, that enabled Watson and Crick to propose their model of DNA.

42. Give various types of chromosomes depending upon location of centromere.
(Rawalpindi Board-New Pattern-2015-A)

Sol. Various Types of Chromosomes Depending Upon Location of Centromere: -

A. Telocentric Chromosomes: -
a. Centromere is located at the terminal position or at one end.
b. The arms of chromatds are present toward one side only.

B. Acrocntric Chromosomes: -
a. The centromere is present very near to end.
b. One side has very short arms of chromatids while other side has very long arms.
c. They are rod shaped.

C. Submetacentric Chromosomes: -
a. The centromere is slightly displaced from the centre.
b. Both sides have arms of unequal length of chromatids.

D. Metacentric Chromosomes: -
a. Centromere is present almost in the center.
b. Both sides have equal or almost equal arms.
c. They are V shaped.

43. Draw shapes of chromosomes depending upon the location of centromere.
(Rawalpindi Board-New Scheme-Group-II-2017-A)

Sol. Diagrams of Shapes of Chromosomes Depending Upon the Location of Centromere: -

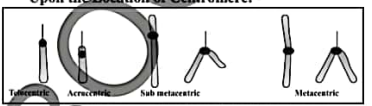


Fig: Shapes of chromosomes depends upon the location of centromere

44. How many chromosomes are present in sugarcane and mouse?
(Rawalpindi Board-New Pattern-2018-A)

Sol. A) Number of Chromosomes in Sugarcane: -
80

B) Number of Chromosomes in Mouse: -
40

45. What is the difference between R_f and S_f type of bacteria? (Rawalpindi Board-New Pattern-2018-A)

Sol. Differences Between R and S Type of Bacteria: -

R Type Bacteria	S Type Bacteria
1. They are mutant bacteria. 2. They are coatless bacteria because they lack an enzyme needed to manufacture polysaccharide coat. 3. They form rough colonies. 4. They are non-pathogenic.	1. They are wild type bacteria. 2. They have polysaccharide coat. 3. They form smooth colonies. 4. They are pathogenic and cause fatal pneumonia in mice.

46. How many DNA polymerases are found in prokaryotes, write their names.
(Sargodha Board-New Scheme-2018-A)

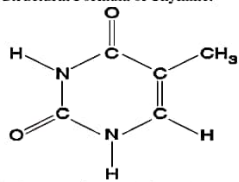
Sol. A) Number of DNA Polymerases Found in Prokaryotes: - Three

B) Names of DNA Polymerases Found in Prokaryotes: -
a. DNA Polymerase I
b. DNA Polymerase II
c. DNA Polymerase III

47. Give structural formulae of adenine and thymine.
(D.G.K. Board-New Scheme-Group-I--2014-A)(DGK-II-18A)

Sol. A) Structural Formula of Adenine: -
See D.G.K Board Answer No: 29 (A)

B) Structural Formula of Thymine: -



48. Differentiate between Transcription and Replication.
(D.G.K. Board-New Scheme-Group-II--2014-A)

Sol. Differences between Transcription and Replication: -

Transcription	Replication
1. It is the process by which RNA is synthesized from a DNA template. 2. RNA polymerase enzyme catalyzes transcription.	1. It is the process by which DNA is duplicated. 2. DNA polymerase catalyzes replication.

49. Define Transformation. (DGK-II-17A)
(D.G.K. Board-New Scheme-Group-I-2015-A)

Sol. Transformation: -

a. Transformation is the transfer of genetic material from one cell to another and can alter the genetic make up of the recipient cell.

b. Transformation was first observed by Griffith in 1928 when DNA of heat killed S-type bacteria changed the live DNA of R-type bacteria into live S-type DNA and then live S-type bacteria in his last experiment.
(Note: - The term transformation is used in following related meanings.

a. It is the process of transmitting genetic information from one bacterium to another bacterium through environment causing it to transform (undergo changes). This principle was first notified by Fred Griffth in 1928.

b. It is the conversion of normal cultured cells into cancerous cells. It is usually produced by certain viruses that can cause the cancerous transformation of normal cells in cultures.

c. It is the process of introducing a recombinant DNA molecule (insert DNA and vector together) into a compitable host cell. This method is applied in biotechnology.)

50. Give the structure of a typical nucleotide.
(D.G.K. Board-New Scheme-Group-II-2016-A)

Sol. Structure Of a Typical Nucleotide: -
A typical nucleotide has three parts:

a. Pentose sugar — It is 5-carbon monosaccharide. In RNA, it is ribose and in DNA it is deoxyribose.

b. A phosphate group — It is present in both DNA and RNA.

c. **A nitrogen-containing base** -- Nitrogenous bases are pyrimidine rings (uraci U, cytosine C, Thymine T or purine rings (adenine A, guanine G). C, U, A and G are present in RNA while C, T, A and G are present in DNA.

51. Draw the molecular basis of a hereditary disease, sickle cell anemia.
(D.G.K. Board-New Scheme-Group-II-2017-A)

Sol. Diagram Showing Molecular Basis of a Hereditary Disease, Sickle Cell Anemia: -

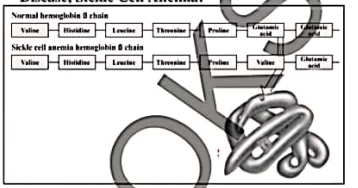


Fig. The molecular basis of a hereditary disease.

52. Give the sequences of nonsense codons?
(Sahiwal Board-New Scheme-2015-A)

Sol. Sequences of Nonsense Codons: -
a. UAA b. UAG c. UGA

53. What will happen to replication of DNA, if primase is not present? (Sahiwal Board-New Scheme-2015-A)

Sol. Effect of Absence of Primase on DNA Replication:-
If primase is not present, an RNA primer can be not constructed and replication can not be started because DNA polymerase cannot initiate synthesis on its own and it can only add DNA nucleotides to already present RNA primer (constructed by primase) to construct the DNA strand.

54. What is meant by universality of genetic code?
(Sahiwal Board-New Scheme-2016-A)

Sol. Universality of Genetic Code: -
Universality of genetic code means that genetic code is universal. It is the same in almost all the organisms. AGA specifies arginine in bacteria, in humans and all other organisms whose genetic has been studied.

55. What are non-sense codons? Give examples.
(Azad Jammuu Kasmir Board -2017-A)

Sol. A) Non-Sense Codons: -

a. Non-sense codons are the mRNA sequences that signal the termination of translation.

b. A non-sense codon is a codon for which no normal tRNA exists.

c. The presence of non-sense codon causes termination of translation (ending polypeptide chain synthesis).

B) Examples: -
There are three nonsense codons, UAA, UAG and UGA.

56. Give the function of ligase and primase enzymes.
(Azad Jammuu Kasmir Board -2017-A)

Sol. A) Function of Ligase Enzyme: -

a. It catalyzes the formation of a phosphodiester bond between the 3/-hydroxyl at one end of the Okazaki fragment and the 5/-phosphate group of an adjacent reaction.

b. It also links other broken areas of the DNA backbone.

B) Function of Primase Enzyme: -
It synthesizes short RNA sequences called primers that serve as starting point for DNA synthesis.

SECTION III

LONG QUESTIONS

1. Explain double helical structure of DNA. (4)
(Lahore Board-Session-2012-2014-Group-I-2014-A)
2. Explain the Meselson-Stahl experiment. (4)
(Sgd-17A, Rwp-14A, Mtn-16A, II-17, Lhr-15A, Sah-18A)
(Lahore Board-New Scheme-Group-I-2015-A)
3. Sketch DNA replication fork and label. (no description) (4) (Sah-15A)
(Lahore Board-New Scheme-Group-I-2016-A)
4. What are chromosomes? What do you know about their types? (4)
(Lahore Board-New Scheme-Group-II-2016-A)
5. Describe types of chromosomes on the basis of centromere. (4)
(Lahore Board-New Scheme-Group-I-2017-A)
6. What hypothesis did Beadle and Tatum test in their experiment on Neurospora? (4)
(Lhr-19A, Sgd-16A)
(Lahore Board-New Scheme-Group-II-2018-A)
7. Describe chemical composition of chromosomes. (4)
(Gujranwala Board-New Scheme-2014-A)
8. Discuss the process of initiation of translation along charging of tRNA. (4)
(Gujranwala Board-New Scheme-2015-A)
9. Describe Griffith's experiment to prove DNA as hereditary material. (4) (Rwp-18A, Grw-18A)
(Gujranwala Board-New Scheme-2016-A)
10. Discuss the process of transcription. (4)
(DGK-I-14A, Rwp-II-17A, Mtn-I-18A)
(Gujranwala Board-New Scheme-2017-A)
11. Explain Replication Process of DNA. (4)
(Multan Board (New Scheme) (2014-A)(Lhr-I-18A)
12. Write a note on Genetic Code. (4)
(DGK-I-15, 16A, Ajk-17, Lhr-14A, Rwp-I-17A)
(Multan Board-New Scheme-2015-A)
13. Define Mutation. Describe point mutation with the help of an example. (4)
(Bwp-17A, DGK-II-15, 18A)
(Multan Board-New Scheme-Group-I-2017-A)
14. Explain one-gene/one-polypeptide hypothesis. (4)
(Multan Board-New Scheme-Group-II-2018-A)
(Bwp-16A, DGK-I-17)
15. Explain briefly "Watson and Crick's Model of DNA" (4) (Bahawalpur Board-New Scheme-2014-A)
16. Describe Double Helical structure of DNA (Watson and Crick's Model. (4)
(Bahawalpur Board-New Scheme-2015-A)
17. Describe the process of Translation. (4)
18. Describe chemical composition of chromosome. (4)
(Faisalabad Board (New Scheme) (2014-A)
19. Explain process of translation. (4)
(Faisalabad Board-New Scheme-2015-A)
20. Describe different types of RNA with their role. (4)
(Faisalabad Board-New Scheme-2016-A)
21. How did Hershey and Chase proved that DNA is the hereditary material? (4)
(Faisalabad Board-New Scheme-2017-A)
22. Explain chemical nature of DNA. (4)
(Sargodha Board-New Scheme-2014-A)
23. Write a note on chemical nature of DNA. (4)
(D.G.K. Board-New Course-Group-II-2017-A)
24. What is Karyotype? Describe types of chromosomes on the basis of centromere. (4)
(D.G.K. Board-New Course-Group-I-2018-A)
25. How the cells use RNA to make protein? (4)
(Sahiwal Board (New Scheme) (2014-A)
26. Explain Watson and Crick's model of DNA. (4)
(Sahiwal Board-New Scheme-2017-A)(DGK-18A)

Chapter ---- 21

CELL CYCLE

2 MCQs

I) From Exercise:-

1) **In Klinefelter's syndrome:**
a) One X is missing
b) Additional sex chromosome is present
c) Sex chromosomes fail to segregate
d) None of these

2) **Mitosis is divided into:**
a) Karyokinesis b) Cytokinesis
c) Interphase **d) Both a and b**

3) **Separation of homologous chromosomes occurs during: (Fsd-14A, DGK-I-14A)**
a) Prophase b) Metaphase
c) Telophase **d) Anaphase**

II) From Punjab Boards:-

1) **Synapsis occurs during: (Mtn-II-14)**
(Lahore Board-New Scheme-Group-I-2014-A)
a) Pachytene b) Leptotene
c) Zygotene d) Diplotene

2) **The spread of tumor cells and establishment of secondary area of growth is known as: (Fsd-17A, Bwp-19A)**
(Lahore Board-New Scheme-Group-II-2014-A)
a) Necrosis b) Apoptosis
c) Metastasis d) Epigenesis

3) **Microtubules are composed of protein tubulin and traces of: (Lhr-I-16, Grw-15)**
(Lahore Board-New Scheme-Group-II-2014-A)
a) RNA b) DNA
c) Glycolipid d) Phospholipid

4) **Full cell cycle in yeast cells has length of: (Lhr-I-16, Mtn-I-18, Sgd-17)**
(Lahore Board-New Scheme-Group-I-2015-A)
a) 30 minutes b) 60 minutes
c) 90 minutes d) 120 minutes

5) **Cytoplasm becomes more viscous during: (Grw-14, DGK-II-17)**
(Lahore Board-New Scheme-Group-I-2015-A)
a) Prophase b) Metaphase
c) Anaphase d) Telophase

6) **The microtubule is composed of traces of RNA and protein called: (Grw-19A, Fsd-14, DGK-I,18)**
(Lahore Board-New Scheme-Group-II-2015-A)
a) Myosin b) Troponin
c) Actin **d) Tubulin**

7) **Phragmoplast is formed by vesicles originated from: (Sah-18A)**
(Lahore Board-New Scheme-Group-II-2015-A)
a) Endoplasmic reticulum **b) Golgi complex**
c) Chloroplast d) Mitochondria

8) **The condensation of chromosomes reaches to its maximum during: (DGK-I-18, Sah-19)**
(Lahore Board-New Scheme-Group-I-2017-A)
a) Diakinesis b) Pachytene
c) Zygotene d) Leptotene

9) **The presence of invading cells other than normal tissue is an indication of:**
(Lahore Board-New Scheme-Group-I-2017-A)
a) Melatoma b) Abnormality
c) Mutation **d) Malignancy**

10) **The interphase of meiosis lacks the stage:**
(Lahore Board-New Scheme-Group-II-2018)
a) G_0 b) G_1
c) G_2 **d) S**

11) **The average cell cycle in human is: (Mtn-I-17, Sah-16)**
(Lahore Board-New Scheme-Group-II-2018)
a) 12 hours **b) 24 hours**
c) 36 hours d) 48 hours

12) **Tissue culture and cloning seek help through:**
(Gujranwala Board-New Scheme-2015-A)
a) Mitosis b) Endomitosis
c) Meiosis d) Karyokinesis

13) **Special type of cell division in which the number of chromosomes in daughter cell is reduced to half as compared to parent cell is called as: (Fsd-15A)**
(Gujranwala Board-New Scheme-2016-A)
a) Mitosis b) Budding
c) Parthenogenesis **d) Meiosis**

14) **Pairing of homologous is called as:**
(Gujranwala Board-New Scheme-2016-A)
a) Synapse **b) Synapsis**
c) Bivalent d) Tetrad

15) **The frequency of occurrence of down syndrome is:**
(Gujranwala Board-New Scheme-2017-A)
a) 1/700 b) 1/40
c) 1/500 d) 1/200

16) **The duration of mitosis in human cell cycle is:**
(Gujranwala Board-New Scheme-2017-A)
a) 30 hours b) 30 sec
c) 30 days **d) 30 min**

17) **The division of whole cell is called:**
(Gujranwala Board-New Scheme-2018-A)
a) Karyokinesis **b) Cytokinesis**
c) Interphase d) Kinetochore

18) **An unwanted clone of cells and establishment of secondary areas of growth is called:**
(Multan Board-New Scheme-2014-A)
a) Tumor b) Growth
c) Lump d) Swelling

19) **In Non-Disjunction, chromosomes fail to segregate during: (Multan Board-New Scheme-2014-A)**
a) Prophase b) Metaphase
c) Anaphase d) Telophase

20) **Cancer is caused mainly by mutation in:**
(Multan Board-New Scheme-2015-A)(DGK-I-17)
a) Somatic cells b) Malignant cells
c) Sex cells d) Reproductive cells

21) **During cell division, the nuclear division is called:**
(Multan Board-New Scheme-2015-A)(DGK-I-14, Sah-17)
a) Cytokinesis **b) Karyokinesis**
c) Karyotype d) Plasmolysis

22) **Unequal separation of chromosome is called:**
(Multan Board-New Scheme-2016-A)
a) Disjunction b) Separation
c) Non-disjunction d) Metastasis

23) **Nerve cells and eye lens cells remain in ---------- stage for life time.**
(Multan Board-New Scheme-2016-A)
a) G_1 b) G_2
c) G_0 d) S

24) **The chromosomes appear as thin threads having length of:**
(Multan Board-New Scheme-Group-I-2017-A)
a) 0.25 µm to 50 µm b) 2.5 µm to 50 µm
c) 25 µm to 50 µm d) 0.025 µm to 50 µm

25) **Mangolism is the other name of:**
(Multan Board-New Scheme-Group-I-2018-A)(Rwp-15A)
a) Klinefelter's Syndrome
b) Turner's Syndrome
c) Down's Syndrome
d) Jacobs

26) **Meiosis II is just like the: (Fsd-17A)**
(Multan Board-New Scheme-Group-II-2018-A)
a) Amitosis b) Regeneration
c) Mitosis d) Replacement

27) **The chances of teenage mother having Down's syndrome child is:**
(Multan Board-New Scheme-Group-II-2018-A)
a) One in one hundred
b) One in one thousand
c) One in many thousands
d) One in ten thousands

28) **The actual cell division is:**
(Bahawalpur Board-New Scheme-2014-A)
a) Meiosis I b) Meiosis II
c) Mitosis **d) Cytokinesis**

29) **Post mitotic cell can exit the cell cycle during:**
(Bahawalpur Board-New Scheme-2015-A)
a) G_0 – phase b) G_1 -- phase
c) S --- phase d) G_2 – phase

30) **Karyokinesis involves division of nucleus and cytokinesis refers to:**
(Bahawalpur Board-New Scheme-2015-A)
a) Division of Whole Cell
b) Division of Cytoplasm
c) Division of Centromere
d) Division of Cell Wall

31) Chromosomes become double during the phase of cell cycle:
(Bahawalpur Board-New Scheme-2017-A)
a) M-Phase b) G1-Phase
c) S-Phase d) G2-Phase

32) The paired chromosomes repel each other and begin to separate during:
(Bahawalpur Board-New Scheme-2017-A)
a) Pachytene **b) Diplotene**
c) Leptotene d) Zygotene

33) Each bivalent consists of four:
(Bahawalpur Board-New Scheme-2018-A)
a) Chromosomes **b) Chromatids**
c) Chiasmata d) Spore

34) Chiasmata formation takes place during:
(Bahawalpur Board-New Scheme-2018-A)
a) Leptotene b) Diakinesis
c) Pachytene d) Diplotene

35) All are related to Turner's Syndrome, except:
(Faisalabad Board-New Scheme-2014-A)
a) Short stature b) Webbed neck
c) Broad face d) Without ovaries

36) The tumor which is localized and not transferred to the other body parts:
(Faisalabad Board-New Scheme-2018-A)
a) Malignant **b) Benign**
c) Apoptosis d) Necrosis

37) Contractile ring in cytokinesis is formed by:
(Rawalpindi Board –New Pattern-2014-A)(SGD-19A)
a) Tubulin **b) Actin and Myosin**
d) Keratin d) Cyclin

38) The phase in meiosis I which may last for days, weeks or even years is:
(Mtn-14A, Fsd-18A, DGK-I-II-15)
(Rawalpindi Board –New Pattern-2014-A)
a) Leptotene b) Zygotene
c) Pachytene d) Diplotene

39) Bivalent or Tetrads are formed in:
(Rawalpindi Board-New Pattern-2015-A)(Rwp-II-17)
a) Leptotene **b) Zygotene**
c) Pachytene d) Diakinesis

40) Synapsis takes place in:
(Sgd-17A, DGK-II-15, DGK-I-17, II-18)
(Rawalpindi Board-New Pattern-2016-A)
a) Leptotene **b) Zygotene**
c) Pachytene d) Anaphase

41) Each chromosome when visible consists of two unseparated replicas:
(Rawalpindi Board-New Scheme-Group-I-2017-A)
a) Chiasma b) Tetrad
c) Homologous chromosome **d) Chromatids**

42) The sex chromosome of the person affected with klinefelter's syndrome are:
(Rawalpindi Board-New Scheme-Group-I-2017-A)
a) XYY b) XXX
c) XXY d) XY

43) The period of life cycle of a cell between two consective divisions is: (Rwp-16)
(Rawalpindi Board-New Scheme-Group-II-2017-A)
a) Prophase b) Telophase
c) Degree phase **d) Interphase**

44) Cell cycle involves:
(Rawalpindi Board-New Pattern-2018-A)
a) Growth of cells
b) Replication of DNA
c) Cell division
d) Growth of cell, replication of DNA and cell division

45) Which of the following behaves like normal cells?
(Sargodha Board-New Scheme-2016-A)
a) Benign tumor b) Malignant tumor
c) Cancer d) Gall

46) What are significant happenings of meiosis?
(Sargodha Board-New Scheme-2016-A)
a) Crossing over b) Random assortment
c) Linkage
d) Crossing over and random assortment of chromosomes

47) Post mitotic cell can exit the cell cycle during phase:
(Sargodha Board-New Scheme-2018-A)(DGK-I-16A)
a) G-0 **b) G-1**
c) G-2 d) S

48) The prophase stage in which the chromosomes become visible, shorten and thick: (DGK-II-16)
(D.G.K. Board-New Scheme-Group-I-2014-A)
a) Liptotene b) Zygotene
c) Pachytene d) Diplotene

49) The Syndrome in which individual has short stature, webbed neck, without ovaries and complete absence of germ cells is:
(D.G.K. Board-New Scheme-Group-I-2015-A)
a) Mangolism b) Klinefelter syndrome
c) Down's syndrome **d) Turner's syndrome**

50) Karykinesis involves division of:
(D.G.K. Board-New Scheme-Group-I-2016-A)
a) Cell **b) Nucleus**
c) Cytoplasm d) Cell membrane

51) The most critical phase of mitosis is: (Lhr-II-19)
(D.G.K. Board-New Scheme-Group-II-2017-A)
a) Anaphase b) Prophase
c) Telophase d) Metaphase

52) Which one is absent in animal cell?
(D.G.K. Board-New Scheme-Group-II-2018-A)
a) Spindle b) Centriole
c) Chromatids **d) Phragmoplast**

53) Mitotic apparatus is organized during:
(Sahiwal Board-New Scheme-2014-A)
a) Prophase **b) Metaphase**
c) Anaphase d) Telophase

54) Each diploid cell after meiosis produces:
(Sahiwal Board-New Scheme-2014-A)
a) Two cells **b) Four cells**
c) Six cells d) Eight cells

55) **Cancer occurs due to error in:** **(Sahiwal Board-New Scheme-2015-A)**
a) Mitosis b) Meiosis
c) Binary fission d) Budding

56) **Crossing over occurs during:** **(Sahiwal Baord-New Scheme-2015-A)**
a) Diplotene **b) Pachytene**
c) Zygotene d) Leptotene

57) **The pairing of homologous chromosomes is completed in:(Sahiwal Board-New Scheme-2016-A) (Fsd-16, DGK-II-19, Lhr-I-19)**
a) Leptotene b) Zygotene
c) Pachytene d) Diplotene

58) **The autosomal non-disjunction in man in which 21st pair chromosome fail to segregate resulting in gametes with 24 chromosome is:** **(Sahiwal Board-New Scheme-2018-A)**
a) Down's syndrome b) Turner's syndrome
c) Klinfilter syndrome d) Jabo's syndrome

59) **Cell commits suicide in the absence of:** **(Azad Jammu Kashmir Board-2017-A)**
a) Survival signals b) Trophic factors
c) Hormones d) Chemicals

III) From Entry Test:-

1) **Prophase, metaphase and telophase are subdivisions of:** **(Entry Test-2007)**
a) Mitosis b) Cytokinesis
c) Karyokinesis d) None of these

2) **Exchange of segments between homologous chromosomes is called:** **(Entry Test-2012)**
a) Segregation **c) Crossing over**
b) Independent assortment d) Mutation

3) **If a person has 44 autosomes + XXY, he will suffer from:** **(Entry Test-2012)**
a) Klinefelter's syndrome c) Turner's syndrome
c) Down's syndrome d) Edward's syndrome

4) **In which stage of Interphase, there is an increase in cell size and many biochemicals are formed?** **(Entry Test-2012)**
a) G2 phase c) S phase
b) G1 phase d) C phase

5) **In Down's syndrome, which one of the following pair of chromosome fails to segregate?** **(Entry Test-2012)**
a) 7 **c) 21**
b) 15 d) 12

6) **Cytokinesis is a division of:** **(Sel-Test Questions-2013)**
a) Cytoplasm c) Nucleus
b) Chromosomes d) Nucleolus

7) **During cell division the plant cell is not seen to have:** **(Self-Test Questions-2013)**
a) Spindle fibers c) Centromere
b) Chromatids **d) Centrioles**

8) **Which human disease is due to meiotic errors?** **(Self-Test Questions-2013)**
a) Typhoid c) Measles
b) Cholera **d) Down's syndrome**

9) **Down's syndrome is a result of non-disjunction of ---------- pair of chromosomes that fails to segregate.** **(Entry-Test-2013)**
a) 21st c) 18th
b) 22nd d) 24th

10) **During which period of interphase (cell cycle) DNA is synthesized?** **(Entry Test-2014)**
a) G_1 **c) S**
b) G_2 d) G_0

11) **The most critical phase of mitosis which ensures equal distribution of chromatids in the daughter cells is:** **(Entry Test-2014)**
a) Prophase **c) Anaphase**
b) Metaphase d) Telophase

12) **Non-disjunction of 21st pair of chromosomes in in one of the gamete leads to 47 chromosomes in one individual. This condition is called:** **(Entry Test-2014-2015)**
a) Turner's syndrome
b) Klinefelter's syndrome
c) Down's syndrome
d) Jacob's syndrome

13) **Typical symptoms like enlarged breasts and small testis in male are attributed to:** **(Entry Test-2015)**
a) Down;s syndrome
b) Turner's syndrome
c) Klinefelter's syndrome
d) Phenylketonuria

14) **Down's syndrome is characterized by ---------- at chromosome 21.** **(Entry Test-2016)**
a) Triosomy c) Poly somy
b) Monosomy d) Disomy

15) **Which of the following is an example of autosomal non-disjunction?** **(Entry Test-2016)**
a) Turner's syndrome c) Metastasis
b) Jacob's syndrome **d) Down's syndrome**

16) **Infertility, short height, webbed neck and low hairline at neck are symptoms of ---------- syndrome.** **(Entry Test-2016)**
a) Turner's c) Edward's
b) Down's d) Patau's

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

2. What are the functions of mitotic apparatus?

Sol. Functions of Mitotic Apparatus: -
Mitotic apparatus is designed to attach and capture chromosomes, aligning them and finally separating them so that equal distribution of chromosomes is ensured. So it provides the framework for chromosome movement during cell division.

3. How can you identify the cancer cells?

Sol. Identification of Cancer Cells: -

1. Cancer cells are less differentiated and non-specialized.
2. They look distinctly abnormal and do not perform normal functions.
3. The nuclei of cancer cells are enlarged and may contain an abnormal number of chromosomes. They have three to twenty mutant genes. Their genes have extra copies.
4. They can enter the cell cycle repeatedly, and in this way seem immortal.
5. Cancer cells fail to undergo apoptosis even though they are abnormal cells.
6. Cancer cells do not adhere well to the neighbouring normal cells.
6. Cancer cells produce enzymes that allow them to invade underlying tissues. Then they travel through the blood and lymph to start cancer cells and tumor elsewhere in the body.

4. Give importance and significance of meiosis.

Sol. Importance and Significance of Meiosis: -

1. Meiosis takes place at the time of sexual cell (gamete) formation, spore formation in plants, halving the number of chromosomes in each, which is restored after fertilization and maintains chromosome number constant generation after generation.
2. Crossing over (exchange of segments of parental chromosomes resulting in a large number of recombination's) and random separation of homologous chromosomes (producing wide range of variety of gametes) are the two phenomena of meiosis which cause variations and modifications in the genome. These variations are not only the bases of evolution but also make every individual specific, particular and unique in his characteristics.

5. Define chromosomal non-disjunction. (Grw-19A, DGK-I-18A, Lhr-I-15, 17A, Grw-14, 18A, Bwp-16, 17A)

Sol. Chromosomal Non-Disjunction: -

1. Chromosomal non-disjunction is the abnormality in which chromosomes fail to segregate during anaphase and telophase and donot finish with equal distribution of chromosome among daughter nuclei.
2. Non-disjunction may occur during the first or second meiotic division or both. When it occurs during first meiotic division at anaphase I, homologous chromosomes fail to separate and when it occurs during second meiotic division at anaphase II, sister chromatids fail to segregate.
3. Non-disjunction leads to gametes with the gain or loss of a chromosome.
4. Non-disjunction may be in autosome or in sex chromosome.
5. When an abnormal gamete unites with a normal, the resulting zygote has a chromosome abnormality with either an increase or decrease in the number of chromosomes causing serious physical, social and mental disorders.

6. What are symptoms of Turner's syndrome?

Sol. Symptoms of Turner's Syndrome: -

The individuals with Turner's syndrome are sterile females of short stature, with a webbed neck (folds of skin around neck and shoulders) and sex organs that never fully mature during puberty. The mental abilities of such individuals are in the low-normal range.

7. Define cell cycle. Highlight its importance and significance.

Sol. A) Cell Cycle: -

The cell undergoes, a sequence of changes, which involves periods of growth, replication of DNA, followed by cell division. This sequence of changes is called cell cycle.

B) Importance and Significance: -

Cell cycle is a phenomenon by which cellular material is divided between daughter cells.

8. Is interphase a resting phase? Why?

Sol. Interphase, A Resting Phase: -

Interphase is not a resting phase because it is a period of great biochemical activities in which cell normally grows in size and prepares itself for next division and duplicates its DNA.

9. In what respect does mitosis in plant cells differ from that in animal cells?

Sol.

Mitosis in Plant Cells	Mitosis in Animal Cells
1. Plants lack visible centrioles, instead they have its analogous region from which spindle microtubules originate. 2. Cytokinesis occurs by formation of membrane structure, phragmoplast formed from Golgi vesicles and microtubules. 3. Shape of the plant cell does not change greatly because it is surrounded by rigid cell wall.	1. Spindle microtubules originate from centrioles. 2. Cytokinesis occurs by contractile ring made of actin and myosin and cleavage furrow. 3. Shape of the animal cell changes greatly.

II) From Punjab Boards:-

1. Describe causes and symptoms of Down's syndrome. (Lhr-I-16A, 18A, Bwp-18A, DGK-I-19A) (Lahore Board-New Scheme-Group-I-2014-A)

Sol. A) Cause of Down's Syndrome: -

It is the result of autosomal non-disjunction in the ova of aged female in which 21st pair of chromosome fails to separate resulting in gamete with two 21st chromesomes instead of one and total of 24 chromosomes. When this ovum is fertilized by a normal sperm, the zygote has 47 (2n + 1) chromosomes with three 21st chromosomes and develops into a Down's syndrome child.

B) Symptoms of Down's Syndrome: -

The affected individuals have flat, broad face, sequent eyes with the skin fold in corner, and protruding tongue, mental retardation, and defective development of central nervous system.

2. What is turner's syndrome?
(Lhr-II-18A, Mtn-I-18A, 16A, Fsd-15A, Rwp-15, II-17A, DGk-I-14A, I-15A)

(Lahore Board-New Scheme-Group-II-2014-A)

Sol. Turner's Syndrome: -

a. It is monopsony for the X chromosome.
b. It occurs in one in about 6000 births.
c. The individuals affected with Turner's syndrome have one missing X chromosome with only 45 chromosomes (44 autosomes +X).
d. Individuals with this condition often do not survive pregnancy and are aborted.
e. Individuals with Turner's syndrome have female appearance with short stature, webbed neck, without ovaries and complete absence of germ cells.

3. Explain tumor.
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. Tumor: -

a. Tumor is a mass of unwanted cells that have been proliferated in uncontrolled fashion.
b. Tumors are clonal in origin, that is, they arise from a single cell.
c. They arise frequently, especially in older animals and humans.
d. Tumors are of two basic types:

i. **Benign Tumor**----Small, localized with cells more or less normal having little deleterious effects
ii. **Malignant Tumor**---Invasive mass with less differentiated abnormal cells that multiply rapidly and undergo metastasis and spread to form new malignant tumors distant from the primary malignant tumor.

4. How do karyokinesis and cytokinesis phase of cell division differ? (Grw-14A, Mtn-14, 16A, Fsd-14A)
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. Karyokinesis Different from Cytokinesis: -

Karyokinesis	Cytokinesis
1. It is the division of nucleus.	1. It refers to division of whole cell.
2. Karyokinesis in plant and animal cells occurs in the same way.	2. It occurs in different way in plant and animal cells.
3. It is sub-divided into prophase, metaphase, anaphase and telophase.	3. It has no sub-stage.

5. Give four importance of mitosis:
(SGD-14A, DGK-I-17A, Mtn-II-18A, Sah-18A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Four Importance of Mitosis: -

a. Development and growth of multicellular organisms depends upon orderly controlled mitosis.
b. Tissue culture and cloning seek help through mitosis.
c. Regeneration, healing of wounds and replacements of older cells all are the gifts of mitosis.
d. With few exceptions, all kinds of asexual reproduction are carried out by mitosis.

6. Describe cell cycle. Give its two phases.
(DGK-II-16A, Sah-19A, Grw-14A, 18A, Fsd-14-16A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. A) Cell Cycle: -
The cell undergoes a sequence of changes, which involves period of growth, replication of DNA, followed by cell division. Each round of growth, DNA replication and cell-division is called a cell cycle.

B) Two Phases of Cell Cycle: -
The cell cycle consists of two main phases:

a. **Interphase: -**
It is a period of cell cycle between two consecutive divisions. It is divided into G_1 phase, S-phase and G_2-phase.
b. **Mitotic (M) phase: -**
It is the next phase of cell cycle in which mature cell splits into two daughter cells. It involves two main processes, mitosis and cytokinesis.

7. How cytokinensis occurs in animals and plants?
(DGK-I-14A, Rwp-14A, Lhr-II-18A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. A) Cytokinensis in Animals: -

a. Cytokinesis of animal cell begins when a ring of contractile microfilaments (actin and myosin microfilaments) associated with plama membrane is formed due to signals of astral microtubules send to the equatorial region. This contractile ring encircles the cell in the equatorial region, at right angle to the spindle.
b. The contractile ring then contracts, producing a cleavage furrow that gradually deepens towards the centre of the cell, dividing the parent cell into two daughter cells.

B) Cytokinesis in Plants: -
Following steps take place in cytokinesis of plants:

a. Vesicles originate from Golgi complex during metaphase.
b. These vesicles line up in the centre of dividing cell at the end of telophase and fuse to from phragmoplast.
c. The membrane of vesicles becomes the plasma membrane of the daughter cells.
d. These vesicles also contain materials for future cell wall such as precursors of cellulose and pectin.

8. What is metastasis? (Mtn-15A, Fsd-16A, 18A, DGK-II-18-I-16A, Bwp-15A, Sgd-14A)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Metastasis: -

a. Spread of tumor cells and establishment of secondary areas of growth is called Metastasis.
b. The term metastasis is usually applied to spreading of cancer cells from their site of origin to other parts of the body.
c. Cells that leave the tumor and spread throughout the body, forming new tumors at distant sites are called metastatic cells.
d. Metastatic cells have following properties:

i. They break their contents with other cells and overcome the restriction on cell movement provided by basal lamina and other barriers, ultimately metastatic cells can invade other parts of the body.
ii. They proliferate, unlimitedly, without considering the checks or programmes of the body.

e. Metastasis is, thus, responsible for the proliferation of multiple malignant tumors any where in the body away from the site of their original appearance.

9. What is mitotic apparatus?
(Lhr-II-19A, Grw-14A, Lhr-I-18A, Fsd-14A, Rwp-II-17A, SGD-16A, DGK-I-18, I-17, II-15A)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Mitotic Apparatus: -

a. Mitotic apparatus is a specialized microtubule structure including centriole, aster and spindle. In plants only spindle fibers form mitotic apparatus because centrioles are absent in the cell of higher plants.
b. Mitotic apparatus is larger than the nucleus.
c. Mitotic apparatus is designed to attach and capture chromosomes, aligning them and finally separating them so that equal distribution of chromosomes is ensured.

10. Define meiosis and mitosis.
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. A) Meiosis: -

Meiosis is a specialized type of cell division occurring during gamete formation that reduces chromosome number by half, creating four haploid cells, each genetically distinct from the parent cell that gives rise to them

B) Mitosis: -

Mitosis is a process that takes place in the nucleus of a dividing cell, involves typically a series of steps consisting of prophase, metaphase, anaphase, and telophase, and results in the formation two nuclei each having the same number of chromosomes as the parent nucleus.

11. What changes occure in dividing cell during Deplotene? (Gujranwala Board-New Scheme-2014-A)

Sol. Changes in Dividing Cell During Deplotene: -

a. At diplotene the paired chromosomes repel each other and begin to separate. However, this separation is not complete, because the homologous chromosomes remain united by their points of interchange, or chiasmata.
b. Chiasmata are generally regarded as the sites where the phenomenon of crossing over takes place. With few exception, chiasmata are found in all plants and animals. At least one chiasma is formed for each bivalent. Their number is variable. Some chromosomes have one chiasma and others have several.
c. During diplotene the four chromatids of the tetrad become visible.
d. During diplotene the synaptonemal complex starts disappearing.

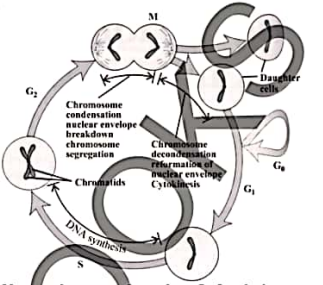
12. What is tetrad?
(Gujranwala Board-New Scheme-2015-A)

Sol. Tetrad: -

a. Tetrad is a four stranded structure formed by coming together of homologous chromosomes in meiosis.
b. It is also known as bivalent.

13. Sketch and label cell cycle. (Sah-15A)
(Gujranwala Board-New Scheme-2016-A)

Sol.



14. Name only stages of prophase I of meiosis.
(Gujranwala Board-New Scheme-2016-A)

Sol. Names of Stages of Prophase I of Meiosis: -

a. Leptotene
b. Zygotene
c. Pachytene
d. Leptotene
e. Diakinesis

15. Enlist four important functions of mitosis.
(Gujranwala Board-New Scheme-2017-A)

Sol. Four Important Functions of Mitosis: -

a. Mitosis ensures the continuity of the genetic information unchanged from parent cell to daughter cells.
b. It provides means for the animals and plants to develop from zygote to adult and further growth during life.
c. It occurs, with few exceptions, in all kinds of asexual Reproduction.
d. Vegetative propagation in plants is also based upon mitotic activity of the vegetative parts.

16. What are the main features of metaphase-I of meiosis?
(Gujranwala Board-New Scheme-2017-A)(Rwp-18A)

Sol. Main Features of Metaphase-I of Meiosis: -

a. Nuclear membrane disorgnizes at the beginning of this phase.
b. Spindle fibers originate and the kinotochore fibers attach to the kinetochore of homologous chromosomes from each pole.
c. Each bivalent with joined pair of homologues then lines up on the metaphase plate (equator).

17. How meiosis is important for living individuals?
(Multan Board-New Scheme-Group-I-2017-A)(Bwp-18A, 15A)

Sol. See Exercise Chapter No: 21 Answer No: 4

18. Why interphase is called Resting Phase?
(Bahawalpur Board-New Scheme-2014-A)

Sol. Interphase Called Resting Phase: -

Interphase is misleadingly called resting phase. Actually it is a period of intense biosynthetic activity in which the cell doubles in size and duplicates precisely its chromosome complement.

19. Which type of Events occur in G_1-Phase? (Bahawalpur Board-New Scheme-2017-A)

Sol. Events Occurring in G_1-Phase: -

a. Cell normally grows in size.
b. Specific enzymes are synthesized.
c. DNA base units are accumulated for the synthesis of DNA.

20. What changes occur in Cell during Anaphase of Mitosis? (Bahawalpur Board-New Scheme-2018-A) (Rwp-15A)

Sol. Changes Occur in Cell During Anaphase of Mitosis: -

a. Kinetochore fibers of spindle contract towards their respective poles.
b. Polar microtubules elongate and exert force to separate sister chromatids from centromere.
c. As a result of above two events, two sets (two halves) of sister chromatids travel towards the opposite poles of the spindle.

21. Differentiate between diplotene and diakinesis. (Faisalabad Board-New Scheme-2015-A)

Sol. Differences Between Diplotene and Diakinesis: -

Diplotene	Diakinesis
1. Homologous chromosomes sart to separate.	1. Separation of homologous chromosomes is completed.
2. Homologous chromosomes remain united by their point of interchange (chiasmata).	2. Homologous chromosomes are still united at one point, more often at ends.
3. Nucleoli are present.	3. Nucleoli disappear.
4. Nuclear envelope is still present.	4. Nuclear envelope sarts fragmenting.

22. Differentiate between benign and malignant tumour. (DGK-II-16A, I-14A, Mtn-II-18A, DGK-I-19A, II-19A) (Faisalabad Board-New Scheme-2017-A)

Sol. Differences Between Benign and Malignant Tumor: -

Malignant Tumor	Benign Tumor
1. It is an invasive mass which can proliferate into other malignant tumors away from its site of origin.	1. It is of small size and localized (not transferred to other parts).
2. Cells in the malignant tumor are less differentiated and fail to perform normal function.	2. Cells in the benign tumor are more or less normal with little deleterious effects.

23. What is Klinefelter's syndrome? (Faisalabad Board-New Scheme-2017-A)

Sol. Klinefelter's Syndrome: -

a. Klinfeleter's syndrome is a genetic disorder that affects males that have one or more extra X chromosomes.
b. It results from a fusion of an XX egg and a normal Y sperm or a normal X egg and an XY sperm.
c. The affected individual has additional sex chromosome e.g., 47 chromosomes (44 + XXY).
d. The affected individuals are typically male, but have frequently enlarged breasts, tendency to tallness, obesity, small testes with no sperms at ejaculation and under developed secondary sex characteristics.
e. It occurs in about 1 out of 1500 males.

24. Write down characteristics of cancer cells. (Rawalpindi Board-New Pattern-2014-A)

Sol. See Exercise Chapter No: 21 Answer No: 2

25. What is interphase? Write the names of its sub stages. (Rawalpindi Board-New Pattern-2016-A)

Sol. A) Interphase: -

a. The period of life cycle of cell (cell cycle) between two consective divisions is termed as Interphase. Or It is the phase of cell cycle in between divisions.
b. It is the period between two mitotic or meiotic divisions in which a cell grows and its DNA replicates.
c. It occupies far the greater part of cell cycle.

B) Names of Sub-Phases of Interphase: -

a. G_1 (Gap 1) phase
b. S (Synthesis) phase
c. G_2 (Pre-mitotic) phase

26. Discuss diakinesis phase of meiosis. (Bwp-19A) (Rawalpindi Board-New Scheme-Group-I-2017-A)

Sol. Diakinesis Phase of Meiosis: -

Diakinesis is the last stage of Prophase I in which nucleolus and nuclear envelope disappear, spindle forms and homologous chromosomes are completely separated but remains united at one point, more often at ends.

27. What are the events of S-Phase? (Rawalpindi Board-New Pattern-2018-A)

Sol. Events of S-Phase: -

a. DNA is synthesized.
b. Chromatid number in each chromosome is doubled.

28. Define crossing over. (DGK-II-15A) (Sargodha Board-New Scheme-2016-A)

Sol. Crossing Over: -

a. It is anexchange of segments between non-sister chromatids of homologous chroosomes during meiosis.
b. It occurs in pachytene stage of prophase I of meiosis I.
c. In crossing over, refsufflig of genetic material occurs which produces recombinations.

29. How Chiasmata formation occurs? (Sargodha Board-New Scheme-2017-A)

Sol. Chiasmata Formation: -

Chismata are X-shaped points of attachment between two non-sister chromaitds of a homologous pair. Chismata are formed during synapsis of homologous chromosomes and can result in the exchange of segments of non-sister chromatids. Chismata hold the homologous chromosomes together as bivalent until anaphase I.

30. Write down two functions of programmed death of a cell. (Sargodha Board-New Scheme-2018-A)

Sol. Two Functions of Programmed Death of a Cell:

a. Programmed cell death helps in proper control of multicellular development, which may lead to deletion of entire structure (e.g., the tail of developing human embryos) or part of structure (e.g., tissue between developing digits).
b. It also controls the number of neurons.

31. What are the events of zygotene of prophase-I of Meiosis? (Sargodha Board-New Scheme-2018-A)

Sol. Events of Zygotene of Prophase-I of Meiosis: -

a. Pairing of homologous chromosomes called synapsis starts.
b. This pairing is highly specific and exactly pointed with no definite starting point (s) and involves in the formation of a special structure called synaptomical complex (SC) that can be observed under electron microscope.
c. The two homologues do not fuse during pairing and form a structure known as bivalent or tetrad.

32. What are three sets of microtubules which originate from each pair of centriole during mitosis. (D.G.K Board-New Scheme-Group-II-2014-A)

Sol. Three Sets of Microtubules Originating from Each Pair of Centriole During Mitosis: -

Three sets of microtubules (fibers) originate from each pair of centrioles:

a. Asteral microtubules radiate from outward and form aster.
b. Polar microtubules extend from each pole to the equatorial region where they generally overlap.
c. Kinetochore microtubules, also called chromosomal spindle fibers, extend from each pole and attach to the kinetochores.

33. What is kinetochore? (DGK-I-16A) (D.G.K Board-New Scheme-Group-I-2015-A)

Sol. Kinetochore: -

a. Under electron microscope kinetochore appears as a plate or cup like disc situated upon the primary constriction or centromere.
b. It is a structure formed from proteins.
c. There are two kinetochores on each centromere.
d. It is a structure into which are inserted microtubules called kinetochore microtubules.
e. It links each chromatid or each homologue to the spindle.
f. Kinetochore functions in chromosome or chromatid distribution during meiosis or mitosis.

34. Define non-disjunction and give one autosomal example. (Sahiwal Board-New Scheme-2014-A)

Sol. A) Non-Disjunction: -

See Exercise Chapter No: 21 Answer No: 5

B) Autosomal Example of Non-Disjunction: -

Down's syndrome is the most common autosomal non-disjunction that occurs in 21st pair of chromosome. The affected individual has flat, broad face, sequent eyes with the skin fold in the inner corner, and protruding tongue, mental retardation and defective development of nervous system.

35. Give length of cell cycle during mitosis in human cell. (Sahiwal Board-New Scheme-2014-A)

Sol. Length of Cell Cycle During Mitosis in Human Cell: -

In human cell, average cell cycle is about 24 hours long, mitosis takes 20 minutes, G_1 9 hours, the S-phase 10 hours, and G_2 4.5 hours.

36. Name only stages of prophase I of meiosis. (Sahiwal Board-New Scheme-2015-A)

Sol. Name of Stages of Prophase I of Meiosis: -

a. Leptotene
b. Zygotene
c. Pachytene
d. Diplotene
e. Diakinesis

37. How does cell death help in development of multicellular organisms? (Sahiwal Board-New Scheme-2016-A)

Sol. Cell Death Help in Development of Multicellular Organisms: -

Cell death can be regarded beneficial during multicellular development when: (Lhr-I-14, 16A)

a. Tail of the developing human embryo is deleted.
b. Tissue between developing digits is deleted.
c. Most of the neurons during development die.

38. What is the importance of kinetochore in the alignment of chromosomes during mitosis? (Sahiwal Board-New Scheme-2016-A)

Sol. Importance of Kinetochore in the Alignment of Chromosomes During Mitosis: -

Kinetochores fibers of spindle attach to the kinetochore of chromosome, and align them at the equator of spindle forming equatorial plate or metaphase plate. When kinetochore fibers contract, chromatids are separated and move towards respective poles.

39. What is malignant tumor? (Rwp-I-18A) (Sahiwal Board-New Scheme-2018-A)

Sol. Malignant Tumor: -

a. Malignant tumor is a large invasive mass of transformed (mutant) cells.
b. It is also known as cancer.
c. Cells comprising malignant tumor divide more rapidly, mostly invade surrounding tissues, get into the body's circulatory system and set up areas of poriliferation away from their site of original appearance.

40. Define syndrome. Name its three types. (Azad Jammuu Kasmir Board -2017-A)

Sol. A) Syndrome: -

Syndrome refers to a group of signs and symptoms that occur together and characterize a particular disease or disorder.

B) Names of Three Types of Syndromes: -

a. Down's Syndrome
b. Turner's Syndrome
c. Klinefelter's Syndrome

SECTION III

LONG QUESTIONS

No Essay Type Question According to New Pattern

Chapter ---- 22

VARIATION AND GENETICS

1 MCQ

I) From Exercise:-

2) What happens when both alleles of a gene pair independently express in a heterozygote? (Sgd-17A, DGK-I-15)
a) Dominance b) Incomplete dominance
c) Over dominance **d) Codominance**

3) A heterozygote offspring quantitatively exceeds the phenotypic expression of both the homozygote parents due to:
a) Dominance b) Incomplete dominance
c) Over dominance d) Codominance

6) Which of the following traits is transmitted directly from affected father to only his sons? (Fsd-14A)
a) Autosomal b) X-linked
c) Y-linked d) X and Y-linked

7) Which phenomenon reduces the chances of genetic recombination and variations among offspring?
a) Linkage b) Crossing over
c) Independent assortment d) Dominance

8) Which of the following traits is not sex-linked recessive?
a) Haemophilia b) Color blindness
c) Hypophosphatemic ricket d) tfm syndrome

9) Which of these traits zigzags from maternal grandfather through a carrier daughter to a grandson?
a) Autosomal **b) X-linked**
c) Y-linked d) X and Y linked

10) When a hemophilic carrier marries a normal man, who among her offspring may be affected:
a) Half her children b) All her daughters
c) Half of her daughters **d) Half of her sons**

11) What is the risk of a color-blind child in a family mother is color-blind but father is normal?
a) 100 % b) 75 %
c) 50 % d) 25 %

12) What is the risk of a color-blind child in a family father is color-blind but mother is normal?
a) Zero % b) 25 %
c) 50 % d) 100 %

II) From Punjab Boards:-

1) All the genes found in a breeding population constitute: (Lahore Board-New Scheme-Group-I-2014-A)
a) Genotype b) Genome
c) Gene frequency **d) Gene Pool**

2) Secretors have dominant secretor Gene "Se" on chromosome: (Sah-18A) (Lahore Board-New Sheme-Group-II-2014-A)
a) 9 **b) 19**
c) 21 d) 24

3) Haemophilia C: (Lahore Board-New Sheme-Group-I-2015-A)
a) Affects both sexes equally
b) Affects men more than women
c) Affects women more than men
d) Is non-allelic recessive sex-linked

4) Human skin color is controlled by gene pairs: (Lahore Board-New Sheme-Group-II-2015-A)(DGK-I-18)
a) Two to four **b) Three to six**
c) Four to six d) Six to ten

5) Rh blood group system is name after its: (Lahore Board-New Sheme-Group-I-2016-A)
a) Discoverer **b) Rhesus monkey**
c) A patient d) Rhino ceros

6) The individual called universal recipient has: (Lahore Board-New Sheme-Group-I-2017-A)
a) B-blood group b) O-blood group
c) AB-blood group d) A-blood group

7) In 1901, ABO group system was discovered by: (Mtn-15A, DGK-II-18, Sah-17) (Gujranwala Board-New Scheme-2014-A)
a) Punnett **b) Karl Landsteiner**
c) Bernstein d) Weiner

8) The position of a gene on the chromosome is called its ----------. (Grw-18, Bwp-14A, Sgd-18A, DGK-I-2016) (Gujranwala Board-New Scheme-2015-A)
a) Allele b) Phenotype
c) Locus d) Genotype

9) The form of appearance of the trait is called: (Gujranwala Board-New Scheme-2017-A)
a) Genotype b) Karyotype
c) Phenotype d) Homozygous

10) Man has linkage groups: (Multan Board-Old Scheme-2014-A)
a) 23 b) 46
c) 22 d) 92

11) Green color blindness is called: (DGK-II-19, Rwp-16A, I-17) (Multan Board-Old Scheme-2014-A)
a) Deuteranopia b) Protanopia
c) Tritanopia d) Color blind

12) --------- is the form of appearance of a trait. (Multan Board-New Scheme-2016-A)(Sah-15A)
a) Genotype **b) Phenotype**
c) Pleiotropy d) Metastasis

13) About 20% suffer from haemophilia B due to disturbance in factor: (Multan Board-New Scheme-Group-I-2017-A)
a) IX b) X
c) XI d) XII

14) Universal recipient blood group is ---------- blood group: (Multan Board-New Scheme-Group-I-2018-A)
a) A b) B
c) AB d) O

15) Protanopia is a: (Multan Board-New Scheme-Group-II-2018-A)
a) Red blindness b) Green blindness
c) Blue blindness d) Brown blindness

16) **Blue cone monocracy is X-linked trait in which:** **(Bahawalpur Board-New Scheme-2015-A)**
a) Red Cone Cells are absent
b) Green Cone Cells are absent
c) Both Red an Green Cone Cells are absent.
d) Blue Cone Cells are absent

17) **Gene for blue opsin is present on Chromosome number: (Bahawalpur Board-New Scheme-2017-A)**
a) 19 b) 09
c) 11 **d) 07**

18) **MN blood group is an example of:** **(Faisalabad Board-New Scheme-2015-A)**
a) Complete dominance **b) Codominance**
c) Incomplete dominance d) Over dominance

19) **Hypophosphataemic rickets is an X-linked:** **(Lhr-I-19A, Bwp-19A) (Faisalabad Board-New Scheme-2017-A)**
a) Dominant traits b) Recessive trait
c) Codominant trait d) Over dominant trait

20) **ABO blood group system in man is encoded by a polymorphic gene I on chromosome:** **(Rawalpindi Board–New Pattern-2014-A)**
a) 7 **b) 9**
c) 21 d) X

21) **Chances of genetic recombination are minimized due to: (Rawalpindi Board–New Pattern-2015-A)**
a) Crossing over
b) Independent assortment of chromosomes
c) Mutation
d) Gene linkage

22) **The maturity onset of the diabetes of the young is: (Rawalpindi Board-New Scheme-Group-II-2017-A)**
a) An autosomal dominant trait
b) An autosomal recessive trait
c) A sex linked trait
d) A sex influenced trait

23) **All the gnes found in a breeding population constitute:** **(Rawalpindi Board-New Pattern-2018-A)**
a) Genotype b) Genome
c) Gene frequency **d) Gene pool**

24) **Mendelian factors were renamed as genes by:** **(Sargodha Board-New Scheme-2016-A)**
a) Menel **b) Correns**
c) Johannsen d) Morgan

25) **The cross which is used to find out the homozygous or heterozygous nature of the genotype is called:** **(D.G.K Board-New Scheme-Group-II-2014-A)**
a) Test cross b) Reciprocal cross
c) Monohybrid cross d) Dihybrid cross

26) **The gene for blue opsin is present on autosome:** **(D.G.K Board-New Scheme-Group-II-2015-A)**
a) 7 b) 11
c) 19 d) 21

27) **Bilirubin damages brain cells and turns the skin and white of eyes yellow, condition is known as:** **(D.G.K. Board-New Scheme-Group-II-2016-A)**
a) Hepatitis b) Leukaemia
c) Botulism **d) Jaundice**

28) **True color blindness is called:** **(Sah-16A) (D.G.K. Board-New Scheme-Group-I-2017-A)**
a) Monochromacy b) Protanopia
c) Tritanopia d) Myopia

29) **A gamete without any sex chromosome is called:** **(D.G.K. Board-New Scheme-Group-II-2017-A)**
a) Sexogamete b) Autogamete
c) Asexogamete **d) Nullogamete**

30) **ABO blood group system is enclosed by a single polymorphic gene with:** **(Sahiwal Board-New Scheme-2014-A)**
a) Three multiple alleles b) Four multiple alleles
c) Five multiple alleles d) Six multiple alleles

31) **The genetic basis of ABO blood group was discovered by:** **(Azad Jammu Kashmir Board-2017-A)**
a) Carl correns b) Landsteiner
c) Bernstein d) T.H. Morgan

III) From Entry Test:-

1) **In moths, male is:** **(Entry Test-2007)**
a) Heterogametic **c) Homogamatic**
b) Dicogametic d) Both b and c

2) **The genes of blue opsins is present on:** **(Entry Test-2007)**
a) Autosome 9 c) Autosome 1
b) Autosome 7 d) Autosome 3

3) **Position of a gene on the chromosome is called its:** **(Entry Test-2007)**
a) Phenotype c) Junction
b) Locus d) Genotype

4) **The color phenotype of the grain is the sum of individual effects of ---- alleles:** **(Entry Test-2007)**
a) Six c) Four
b) Five d) Five or three

6) **The gene for ABO blood group system in humans is is represented by symbol:** **(Entry Test-2012)**
a) X c) Y
b) I d) O

7) **In men, sex determination depends upon the nature of:** **(Entry Test-2012)**
a) Heterogametic male b) Monogametic female
c) Heterogametic female d) Monogametic male

8) **When a single gene effects two or more traits, the phenomenon is called:** **(Entry Test-2012)**
a) Epistasis c) Dominance
b) Pleiotropy d) Over dominance

9) **A gene which has multiple phenotypic effect is called:** **(Self-Test Questions-2013-2014)**
a) Pleiotropic c) Multiple allele
b) Epistasis d) Locus

10) **Change in the nature of gene is known as:** **(Self-Test Questions-2013)**
a) Incomplete dominance **c) Mutation**
b) Pleiotropy d) Polygenic trait

13) **When a gene expresses the effect of a gene at another locus, this is known as:** **(Entry Test-2014)**
a) Epistasis c) Complete dominance
b) Co-dominance d) Mutation

14) In male the sex determining gene is: **(Entry Test-2014)**

a) XY c) SYX
b) SRY d) SXX

15) Position of a gene within a DNA molecule is: **(Entry Test-2014)**

a) Locus c) Amplicon
b) Origin d) Filial

16) X-linked recessive trait is: **(Entry Test-2015)**

a) Hypophosphataemia
b) Vitamin.D resistant rickets
c) Haemophilia
d) Diabete Mellitus

17) Human skin color is good example of: **(Entry Test-2015)**

a) Sex-linked inheritance
b) Polygenic inheritance
c) X-linked inheritance
d) Y-linked inheritance

18) The number of pairs of autosomes in humans is: **(Entry Test-2015)**

a) 23 c) 21
b) 24 **d) 22**

19) ABO blood system is an example of: **(Entry Test-2015)**

a) Polygenes **c) Multiple alleles**
b) Multiple genes d) Multiple mutation

20) Which one of the following is X-linked trait? **(Entry Test-2016)**

a) Male pattern baldness
b) Diabetes mellitus
c) Haemophilia
d) Erythroblastosis fetalis

21) A character determined by three alleles is: **(Entry Test-2016)**

a) Human skin color c) Human eye color
b) Human blood group d) Human Rh factor

22) The total number of genes in a population is called: **(Entry Test-2016)**

a) Gene pool c) Genome
b) Allele pool d) Genomic library

23) Pure breeding lines of pea taken regarding seed shape --- Round and wrinkled and were crossed with no intermediate between parents. All offsprings were found to be round. These results show: **(Entry Test-2017)**

a) Co-dominance
b) Dominance-recessive relationship
c) Incomplete dominance
d) Over dominance relationship

24) The condition in which the heterozygote has a phnotype intermediate between contrasting homozygous parents is called as: (Entry Test-2017)

a) Dominance c) Co-dominance
b) Incomplete dominance d) Over-dominance

26) Locus stands for: **(Entry Test-2017)**

a) Position of gene on homologous chromosome
b) Regions of chromosomes
c) Position of an allele within a DNA molecule
d) Close regions of same chromosome

27) The gene for red-green color blindness is present on: **(Entry Test-2017)**

a) Y-chromosome c) Autosome 7
b) X-chromosome d) Autosome 9

28) Self-fertilization of F1 dihybrids, following independent assortment of alleles result in: **(Entry Test-2017)**

a) 3/16 Tall-round : 3/16 Dwarf-wrinkled
b) 9/16 Tall-wrinkled : 3/16 Dwarf-round
c) 9/16 Tall-round : 3/16 Dwarf-round
d) 3/16 Tall-wrinkled : 3/16 Dwarf-round

29) As aresult of cross-fertilization of a pure breeding pea plant having purple colored flowers with that of white colored flowers, the offsprings will have flowers with: **(Entry Test-2017)**

a) 1/4 purple : 3/4 white c) All white
b) 1/4 white : 3/4 purple **d) All purple**

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. Differentiate between:

a. Phenotype and genotype
(Mtn-17A,, Sah-14, 15A, Lhr-Ii-14A, Ajk-17A, Grw-17A)

b. Homozygous and heterozygous

c. Autosome and sex chromosome (Lhr-I-14, 16A)

d. Allele and multiple allele

e. Incomplete dominance and complete dominance

g. Gene and allele
(Mtn-II-18A, Rwp-14,16A, Sgd-14A, Lhr-14A)

h. Monohybrid and dihybrid

i. Dominance and epistasis

j. X-linked trait and Y-linked trait

k. Sex limited and sex influenced trait

l. Dominant trait and recessive trait

m. Wild type and mutant

Sol. a. Differences Between Phenotype and Genotype:

Phenotype	Genotype
1. It refers to the physical appearance of a trait. 2. It is the visible expression or outcome of genotype. 3. Tallness is the phenotype of a pea plant.	1. It is genetic make up of a trait. 2. It is the genetic information inherited by organism in the form of genes or alleles for a particular trait or traits. 3. TT or homozygous tall or Tt or heterozygous tall is the genotype of tall pea plant.

b. Differences Between Homozygous and Heterozygous: -

Homozygous	Heterozygous
1. Having a pair of identical alleles for a particular locus is called homozygous. 2. RR or rr is a homozygous condition because two allels for seed shape are similar. In RR condition both the allels are of round shape while in rr condition both alleles are of wrinkled shape. 3. An individual with a homozygous genotype is a homozygote.	1. Having a pair of unlike alleles for a particular locus is called heterozygous. 2. Rr is a heterozygous condition because two alleles of gene pair for seed shape are different from each other, one is allele for round shape and other is allele for wrinkled shape. 3. An individual with a heterozygous genotype is a heterozygote.

c. Differences Between Autosome and Sex Chromosome:

Autosome	Sex Chromosome
1. An autosome is a chromosome that is not concerned with the determination of sex. 2. Any eukaryotic chromosome that is not a sex chromosome is autosome. 3. Autosomes are present in the same number and kind (morphology) in both males and females of the species.	1. Chromosome that determines the sex of an individual is called sex chromosome. 2. Usually a pair of chromosome is sex chromosome. 3. Sex chromosomes differ in morphology, and are present in different numbers in males and females.

d. Differences Between Allele and Multiple Allele: -

Allele	Multiple Allele
1. Two alternative forms of a gene occupying a single locus are known as alleles. 2. Alleles occupy corresponding loci on homomlogous chromosomes, they are never present on the same chromosome. 2. The height of a pea plant is determined by two alleles, T and t. T is responsible for tallness while t for dwarfness.	1. Three or more (more than two) forms of a gene occupying a single locus are known as multiple alleles. 2. Multiple alleles also occupy corresponding loci on homomlogous chromosomes, but only of them are present in an individual and the rest are present in the population. 2. A well-known example of multiple alleles in human being is that of ABO blood group. ABO blood group is determined by three alleles I^A, I^B and i. The I^A allele is responsible for the production of the A antigen, I^B the B antigen and the i allele produces neither.

e. Differences Between Incomplete Dominance and Co-dominance:

Incomplete Dominance	Co- dominance
1. Incomplete dominance is the condition in which neither allele on a locus is completely dominant over the other, with the result that heterozygotes are intermediates between the two homozygotes. 2. Red and white colors of flowers in Japanese four-O' clock plants (*Mirabulus jalapa*) are determined by alleles $R_1$and R_2 respectively. When both these alleles are together (R_1R_2) in a heterozygote, a pink flower (intermediate between red and white) is produced.	1. Co-dominance is a condition in which two different alleles of a particular gene on a locus are expressed together in a heterozygote. 2. In case of MN blood group, the allele L^M produces M antigen on RBC and L^N produces N antigen. When both these alleles are together (L^M and L^N) in a heterozygote, both M an N antigens are produced.

g. Differences Between Gene and Allele: -

Genes	Alleles
1. Genes are distinct units of hereditary material found in chromosomes, each gene has a particular nucleotide sequence encoding a particular polypeptide chain. 2. Genes usually exist in pairs, however, some have more than two members. Genes may or may not be present on the same chromosome occupying different loci (position of a gene on chromosome).	1. Alleles are also the genes but represent variants of a particular gene. 2. Alleles are usually two (in some cases three or more) partners of a gene controlling a same character. Alleles occupy corresponding loci on homomlogous chromosomes, they are never present on the same chromosome.

h. Differences Between Monohybrid and Dihybrid: -

Monohybrid	Dihybrid
1. The individual that is heterozygous for one particular trait is called monohybrid. 2. It is the offspring produced by cross-fertilization between two organisms differing in two characters (traits).	1. The individual that is heterozygous for two traits is called dihybrid. 2. It is the offspring produced by cross-fertilization between organisms differeing in four characters (i.e. in one contrasing pair of traits).

i. Differences Between Dominance and Epistasis: -

Dominance	Epistasis
1. It is the relationship between alleles of the same gene occupying the same locus. 2. The allele controlling tallness of a pea plant (i.e. T) always masks the expression of allele for dwarfness (i.e. t) when both are present in a heterozygote.	1. It is the interaction between two different genes occupying different loci. 2. The allele pair hh masks the expression of alleles I^A and I^B. hh genotype does not produce sugar necessary for the attachment of antigents A and B on RBC produced by I^A and I^B respectively, hence alleles I^A or I^B or both are not phenoypically expressed.

j. Differences Between X-linked Trait and Y-linked Trait: -

X-linked Trait	Y-linked Trait
1. It is the trait whose gene is present on X chromosome. 2. It zigzags from maternal grandfather through a carrier daughter to a grandson. It never passes direct from father to son because a son inherits only Y chromosome from father. 3. Hemophilia and color blindness are two examples of X-linked trait.	1. It is a trait whose gene is present on Y chromosome. 2. Y-linked traits are passed from father to son and are never observed in females. 3. Malness in man is a Y-linked trait which is determined by SRY gene on Y chromosome.

k. Differences Between Sex limited and Sex Influenced Trait: -

Sex Limited Trait	Sex Influenced Trait
1. It is genetic trait that is limited to only one sex due to anatomical differences. 2. These traits may be controlled by sex-linked or autosomal genes. 3. For example, beard growth in humans is limited to men. A woman does not grow a beard itself but she can pass the genes specifying heavy beard growth to her sons.	1. It is a genetic trait that is expressed differentally in males and females. 2. It is controlled by an allele that is expressed as dominant in one sex but recessive in other. 3. For example, pattern bladness is a sex-influenced trait. Many more men than women are bald. It is inherited as an autosomal dominant trait in males but as an autosomal recessive trait in females. A heterozygous male is bald but a heterozygous female is not. A woman can be bald only when she is homozygous recessive.

l. Differences Between Dominant Trait and Recessive Trait: -

Dominant Trait	Recessive Trait
1. It is a trait (characteristic) that is expressed in heterozygotes. 2. Following seven traits of garden pea studied by Mendel are dominant: Tallness, purple color of flower, axial flower position, green color of pod, inflated shape of pod, yellow color of seed and round shape of seed.	1. It is trait (characteristic) that is only expressed in homozygotes. 2. Following seven trits of garden pea studied by Mendel are recessive: Dwarfness of pea plant, white color of flower, terminal flower position, yellow color of pod, constricted shape of pod, green color of seed and wrinkled shape of seed.

m. Differences Between Wild type and Mutant: -

Wild Type	Mutant
1. Wild type is phenotypically normal, naturally occurring, form of a gene or organism. 2. This phenotype or genotype is characteristic of the majority of individuals of a species in a natural selection. 3. Wild type *Drosophila* fly has a long wings, red eyes and a gray body.	1. A mutated gene is known as mutant. An organism that carries a gene that has undergone a mutation is also called mutant. 2. Mutant is one that differs strikingly from normal genotype or phenotype of the same species. 3. Mutant *Drosophila* fly has short (vestigial) wings, white eyes, and black body.

2. What is a gene pool?

Sol. Gene Pool: -

1. All the genes/alleles found in a breeding population at a given time are called the gene pool.
2. It is the total genetic information encoded in the total genes in a breeding population existing at a given time.
3. Alleles are like beans in a bean bag. The entire bean bag full of beans is the gene pool of the population.
4. A sample population of 100 diploid plants, some of which bear red flowers while others bearing white flowers, has a sum total of 200 of all different alleles (R or r) for flower color trait as its gene pool.

3. Was a pea lucky choice for Mendel? What would have happened if he had studied an eighth character?

Sol. A) Pea as Lucky Choice for Mendel: -

Yes, Pea was a luckey choice for Mendle. Pea has seven pairs of homologous chromosomes. Mendel knew nothing about chromosomes. The traits he studied were confined to only four chromosomes. He reported independent assortment of those traits whose genes were either on different homologous, or were so far away from each other on the same chromosome that appeared to assort independently due to crossing over.

B) Happening if Mendel had Studied an Eight Character: -
If Mendel had studied eighth character whose alleles would have linked close to alleles of one of the seven characters and would not assort independently.

4. What is test cross? Why did Mendel device this cross?

Sol. A) Test Cross: -

1. Test cross is a mating in which an individual showing a dominant genotype is crossed with an individual showing its recessive phenotype.
2. Test cross finds out the homozygous or heterozygous nature of the genotype showing dominant generation.

B) Why Mendel Deviced Test Cross: -
Mendel devised the test cross to test the genotype of an individual showing a dominant phenotype and established true-breeding lines or varities for each trait.

5. What would happen if alleles of a pair do not segregate at meiosis? How would it effect the purity of gamete?

Sol. A) If Segregation Would Not Occur: -
If alleles of a pair do not segregate at meiosis, it would lead to abnormal separation of alleles in gametes. Some gametes would have both alleles, other would have neither of both.

B) Effect On Purity of Gamete: -
It would disturb the purity of gamete according to which each gamete receives only one of two alleles.

6. If the allele do not assort independently, which type of combination is missing in the progeny?

Sol. Type of Combination Missing If the Allele Do Not Assort Independently: -
If the alleles do not assort independently, recombinant individual is missing in the progeny.

7. Why has each gamete equal chance of getting one or the other allele of a pair?

Sol. Why Each Gamete Has Equal Chance of Getting One or the Other Allele of a Pair: -
Each gamete has equal chance of getting one or the other allele of a pair because of random separation of chromosomes, hence alleles at meiosis.

8. Does the dominant allele modify the determinative nature of its recessive partner? What sort of relationship do they have?

Sol. Is Nature of Recessive Gene Modified:
No, the dominant allele does not modify the nature of its recessive partner. It just masks the expression of recessive gene in its presence. The recessive expresses itself equally well in homozygous condition.

9. Which type of traits can assort independently?

Sol. The Type of Traits That Can Assort Independently: -
Those traits can assort independently whose alleles are residing non-homologous chromosomes.

10. Why does the blood genotype of a person remain constant throughout life?

Sol. Blood Genotype of a Person Remains Constant Throughout Life: -
Blood group phenotype of a person remains constant because alleles controlling blood group start their expression at early embryonic stage and keep on expressing themselves till death.

11. What is a universal blood donor?

Sol. Universal Blood Donor: -
Blood group O are used as donor for O recipient exclusively. It can also be used as donor for small transfusions to A, B and AB recipients because donor's antibodies are quickly absorbed by other tissues or greatly diluted in the recipient's blood stream. Hence O blood group individuals are called universal donors.

12. How can you protect the baby against Rh-incompatibility?

Sol. Protection of Baby Against Rh-Incompatibility: -

1. Baby can be protected against Rh-incompatibility by giving her mother an injection of Rh antiserum during early pregnancy and immediately after birth. The Rh—antibodies in Rh antiserum will destroy Rh+ RBC of the fetus before they stimulate production of maternal anti—Rh antibodies. The injected antiserum disappears before the next pregnancy.
2. Sometimes a mild ABO incompatibility protects the baby against a more severe Rh—incompatibility. If O-mother conceives A+ or B+ baby, any fetal A or B type RBC entering the mother's blood a quickly destroyed by her anti –A or ant—B antibodies, before she can form anti—Rh antibodies.

13. What is multifactorial inheritance?

Sol. Multifactorial Inheritance: -

1. It is polygenic inheritance with environmental influence.
2. Blood pressure is an example of multifactorial trait. Blood pressure is influenced by environment factors such ,as diet, stress and tension.
3. Diabetes mellitus is another example of multifactorial inheritance which is inherited by several genes and is influenced by environment.

14. What is MODY?

Sol. MODY: -

1. MODY means maturity onset diabetes of the young.
2. It is the form of diabetes mellitus type II which is developed before 25 years of age.
3. About 2 % - 5 % of type II diabetics develop MODY.
4. MODY can be inherited as an autosomal dominant trait.
5. About 50 % of cases of MODY are caused by mutation in glycokinase gene. Glycokinase enzyme usually converts glucose to glucose-6-phosphate in pancreas.
6. MODY can also be caused by mutations in any of the four genes which encode transcription factors involved in pancreatic development and insulin regulation.

15. Can a child have more intelligence (IQ score) than his parents?

Sol. Child IQ: -
Yes, a child can have more intelligence (IQ score) than his parents because intelligence is controlled by polygene which can be improved by environment.

II) From Punjab Boards:-

1. Differentiate between gene and gene pool.
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Differences Between Gene and Gene Pool: -

Gene	Gene Pool
It is basic unit of heredity that has informations needed to code for a polypeptide.	All the genes in a population are collectively called gene pool.

2. Define True Breeding.
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. True Breeding: -

a. A true breeding variety is one which, upon self-fertilization, always produces offspring identical to the parents.
b. It is an alternative term for homozygous.

Examples: -

ii. A true-breeding "round" seed plant produces only "round" seeds.
ii. A true-breeding wrinkled seed plant produces only wrinkled seeds.

3. Compare allele with multiple alleles.
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. See Exrcise Chapter No: 22 Answer No: 1 (d)

4. How can you calculate recombination frequency between two linked genes?
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Calculation of Recombination Frequency Between Two Linked Genes: -

The recombination frequencies between two linked genes can be calculated by backcrossing the heterozygote to a homozygous recessive.

$$\text{Recombination frequency} = \frac{\text{Recombinant types}}{\text{Sum of all combinations}} \times 100$$

5. What is MODY? (Lhr-II-16A, Mtn-II-17A, Fsd-17A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. See Exrcise Chapter No: 22 Answer No: 14

6. Explain sex-limited traits. (Lhr-I-18A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Sex-Limited Traits: -

a. Sex-limited traits are limited to only one sex due to anatomical differences.
b. Sex-limited trait affects a structure or function of the body present in only males or only females.
c. These traits may be controlled by sex-linked or autosomal genes.

Examples: -

a. Genes for milk yield in diary cattle affect only cows.
b. Beard growth in humans is limited to men. A woman does not grow a beard herself but she can pass the genes specifying heavy beard growth to her sons.

7. Explain testicular feminization syndromes.
(DGK-I-15, 16, 17)
(Lahore Board-New Scheme-Group-I-2015-A)

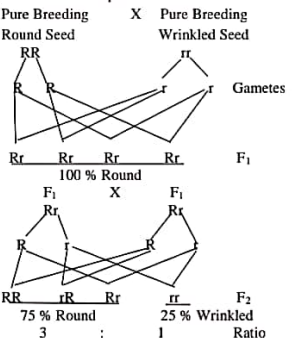
Sol. Testicular Feminization Syndromes: -

a. Testicular feminization syndrome is a rare X-linked recessive trait.
b. It is caused by tfm gene located on X chromosome.
c. It usually occurs in males having XY set of chromosomes, but tfm gene on their X chromosome develops them physically into females. They have breast, female genetalia,a blind vagina but no uterus. They also have degenerated testes in their abdomen.
d. It is an androgen sensitivity syndrome in which Male sex hormone testosterone has no effect on them.

8. What is law of segregation?
(Fsd-18A, Lhr-I-18A, Grw-18A, Mtn-II-18)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Law of Segregation: -

a. Law of Segregation states that:
"Of the two alleles controlling each character, only one is present in each gamete".
b. Mendel's law of segregation explains the presence of descrete heredity units, their simpler interaction leading to dominance, their segregation and recombination at random.
c. Mendel crossed a pure breeding round seed pea plant with a pure breeding wrinkled seed plant. In F_1 generation, he obtained all round seed plants indicating that round seed shape is dominant over wrinkled seed shape. But, when he self-crossed F_1 plants, he obtained round and winkled seed plants in a ratio of 3:1. If the dominant round seed shape is reperesented by R and dwarf by r, then Mendel's experiment can be explained as follows:



9. What are multiple alleles? Give one example.
(Fsd-18A, Mtn-II-17A, Bwp-14, 16A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Multiple Alleles with One Example: -

A) Multiple Alleles: -

a. Two or more alternative forms of a gene on single locus which arise by gene mutation are called multiple alleles.
b. Multiple alleles may have 3 to as many as 30 alleles.
c. All multiple alleles are produced by gene mutations.
d. Any two of these multiple alleles can be present in the genome of a diploid organism, but a haploid organism or a gamete can have just one of them in its genome.

B) Example: -

a. The ABO blood group is encoded by a single polymorphic gene I on chromosome 9 which has three multiple alleles I^A, I^B and i.
b. Alleles I^A and I^B are codominant to each other, although each is dominant to allele i.
c. The allele I^A is responsible for producing antigen A, I^B the B antigen, and the i allele produces neither.
d. The individuals of genotype I^AI^A or I^Ai are type A phenotype, individuals of genotype I^BI^B or I^Bi are type B phenotype, the individuals of genotype I^AI^B are type AB phenotype and individuals of genotype ii are type O phenotype, the recessive genotype.

10. Differentiate between linkage and linkage group.
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Differences Between Linkage and Linkage Group:-

Linkage	Linkage Group
1. It is the phenomenon of staying together of all the genes on a pair of homologous chromosomes. 2. Gene linkage is physical relationship between genes of a chromosome.	1. Linkage group is a group of genes whose loci are present in the same pair of homologous chromosomes. 2. Linkage group is physically linked genes of a chromosome.

11. What is a true breeding variety?
(Lahore Board-New Scheme-Group-I-2016-A)

Sol. True Breeding Variety: -

a. A true breeding variety is one which, upon self-fertilization, always produces offspring identical to the parents.
b. It is an alternative term for homozygous.

Examples: -

ii. A true-breeding "round" seed plant produces only "round" seeds.
ii. A true-breeding wrinkled seed plant produces only wrinkled seeds.

12. Describe sex influenced traits.
(Sah-14A, Grw-16A, Bwp-18A)
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Sex Influenced Traits: -

a. It is a genetic trait that is expressed differentially in males and females due to hormonal differences between the sexes.
b. It occurs in both males and females but it is more common in one sex.
c. It is controlled by an allele that is expressed as dominant in one sex but recessive in other. This difference in expression is due to hormonal difference between the sexes.

Example:

Pattern bladness is a sex-influenced trait. Many more men than women are bald. It is inherited as an autosomal dominant trait in males but as an autosomal recessive trait in females. A heterozygous male is bald but a heterozygous female is not. A woman can be bald only when she is homozygous recessive.

13. Define gene linkage and gene linkage groups.
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. A) Gene Linkage: -

a. It is the phenomenon of staying together of all the genes on a pair of homologous chromosomes.
b. Gene linkage is physical relationship between genes of a chromosome.

B) Gene Linkage Groups: -

a. Linkage group is a group of genes whose loci are present in the same pair of homologous chromosomes.
b. The number of linkage groups corresponds to the number of homologous pairs of chromosomes. Man has 23 linkage group groups.

14. Give significance of test cross.
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. Significance of Test Cross: -

Offspring that show the dominant character are alike phenotypically but may be either homozygous or heterozygous for that character. To determine their genotype test cross is used. It helps in determining the homozygosity or heterozygosity of the dominant parent.

15. What is heterogametic individual? Give example.
(DGK-14A)
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. A) Hetrogametic Individual: -

The individual that produces two types of sex determining gametes is called heterogametic individual.

B) Example: -

Humale male is a heterogametic individual who produces two types of sex-determining sperms. Half the sperms carry X-chromosome and other half carry Y-chromosome. The chances for both types of sperms for fertilization are equal.

16. What is product rule? **(Bwp-17A)**
(Gujranwala Board-New Scheme-2014-A)

Sol. Product Rule: -

a. When two independent events are occurring simultaneously like in Dihybrid cross, the ratio of each joint phenotypic combination can be obtained by multiplying the probabilities of individual phenotypes. It is called product rule.

b. The joint probability that both of the independent events will occur simultaneously, is equal to the product of individual probabilities of each event.

c. For example, in a cross between two triats e. g. seed shape and seed color the F_2 results between two separate monhybrid crosses are listed as:

i. The chance of round seeds = ¾
The chance of wrinled seeds = ¼

ii. The chance of yellow seeds = ¾
The chance of green seeds = ¼
By using product rule, we know that:
The chance of round and yellow seeds = ¾ x ¾ =9/16
The chance of round and green seeds = ¾ x ¼ = 3/16
The chance of wrinkled and yellow seeds = ¼ = ¾ = 3/16
The chance of wrinkled green seeds = ¼ x ¼ = 1/16

17. What is incomplete dominance? (Mtn-14A) (Gujranwala Board-New Scheme-2015-A)

Sol. Incomplete Dominance: -

Incomplete dominance is a type of inheritance in which neither of the pair of contrasting alleles is dominant over the other and the heterozygous individual is intermediate in phenotype.

Example: -

In Four O' clock, flower color is controlled by single gene with two alleles. A cross between a homozygous red-flowered Four O' clock and a homozygous white colored Four O' clock will pink F_1 heterozygotes. When these F_1 plants are self-pollinated, they produce an F_2 generation containing a mixture of red-, pink- and white flowered plants in the ratio 1:2:1.

18. What is erythroblastosis foetalis? (Mtn-14A) (Gujranwala Board-New Scheme-2015-A)

Sol. Erythroblastosis Foetalis: -

a. It is the hemolytic disease of Rh + fetus whose mother is Rh-.

b. It occurs when mother Rh antibodies destruct RBCs fetus leading to anemia due to which fetus starts to release many immature erythroblasts into his blood.

c. Erythroblastic foetalis usually leads to still birth or abortion.

d. Even if pregnancy continues, the spleen and liver of the fetus rapidly produce RBC and often swell.

e. Continuous hemolysis of RBCs leads to the formation of bilirubin that causes damage to brain cells leading to jaundice.

f. Baby, if born alive, suffers from severe hemolytic anemia and jaundice.

19. Differentiate between multiple alleles and polygenes. (Gujranwala Board-New Scheme-2016-A)

Sol. Differences Between Multiple Alleles and Polygenes: -

Multiple Alleles	Polygenes
1. Multiple alleles are more than two forms a gene found at a single locus.	1. Polygenes are alleles of two or more different gene pairs found at different loci.
2. Multiple alleles influence the same trait in dominant, recessive or codominant way.	2. Polygenes influence the same trait in additive way.
3. Multiple alleles produce qualitative phenotypes.	3. Polygenes produce quantitative phenotypes.

20. What is probability and product rule? (Gujranwala Board-New Scheme-2017-A)

Sol. Probability and Product Rule: -

A) Probability: -
It is the chance of an event to occur.

B) Product Rule: -
It is the rule for combining the probabilities of independent events by multiplying their individual probabilities.

21. State law of independent assortment. (Bwp-17A) (Gujranwala Board-New Scheme-2017-A)

Sol. Law of Independent Assortment: -

a. It sates that:
"When two contrasting pairs of traits are followed in the same cross, their alleles assort independently into gametes".

b. According to law of independent assortment, alleles of one pair inherit independently of the other pair. The distribution of alleles of one trait into gamete has no influence on the distribution of alleles of the other trait.

c. For example, when homozygous dominant round and yellow seed plant is crossed with homozygous recessive wrinkled and green seed plant, the chance for a plant to be round or wrinkled is independent of its chance of being yellow or green.

d. The two traits, whose genes are either present on different homologous chromosomes or far away from each other on the same chromosome, appear to assort independently due to crossing over.

22. What is haemophilia? Give its different types. (Gujranwala Board-New Scheme-2018-A)(Mtn-16A)

Sol. A) Haemophilia: -

a. Hemophilia is a group of heredity diseases characterized by failure of blood to clot.

b. It is an X-linked recessive disorder that results in a reduction or malfunction or complete absence of one f the blood component required for clotting as a result of an inherited genetic mutation.

c. Hemophiliac's blood fails to clot properly after an injury. It is a serious hereditary disease because a hemophiliac may bleed to death even from a minor cuts.

B) Different Types of Hemophilia: -
Hemophila is of three types:

A. Hemophilia A: -

a. Hemophilia A is sex-linked recessive trait.
b. It is controlled by single recessive gene h located on X chromosome.
c. 80% hemophiliacs, suffer from hemophilic A.
d. Hemophilia A is caused by the absence of blood clotting factor VIII.
e. It is charrcaterized by severe internal bleeding in the head, joints, and other areas from even a slight wound.

B. Hemophilia B: -

a. It is an X-linked recessive disorder.
b. About 20% hemophilics, suffer from hemophilia B.
c. It is caused due to disturbance in clotting factor IX.
d. Being X-linked recessive, it is more common in men than women.

C. Hemophilia C: -

a. Less than 1% suffer from hemophilia C.
b. It is caused due to reduction in clotting factor XI.
c. Hemophilic C is autosomal disorder and affects both the sexes equally.

23. What is Hypophosphatemic Rickets?
(Multan Board-New Scheme-2014-A)

Sol. Hypophosphatemic Rickets: -

a. It is a rare hereditary disease.
b. It is an X-linked dominant trait.
c. It is caused due to genetic communication failure at molecular level. The genes encoding bone proteins never receive vitamin D's message to function.

24. Define linkage. (Multan Board-New Scheme-2015-A)

Sol. Linkage: -

a. The phenomenon of staying together of all the genes of a chromosome is called gene linkage.
b. Gene linkage is a physical relationship between genes.
c. All the genes on the same chromosome are linked to one another and form a linkage group.
d. The number of linkage groups corresponds to the number of homologous pairs of chromosomes. Man has 23 linkage group groups.
e. Linked genes whose loci are close to each other do not obey Mendel's law of independent assortment, because these cannot assort independently during meiosis.
f. Gene linkage minimizes the chances of genetic recombination and variations among offspring.
g. Genes for color blindness, hemophilia, gout etc. form one linkage group on human X-chromosome.
h. Gene for sickle cell anemia, leukemia and albinism make another linkage group on human chromosome 11.

25. Define Crossing Over.Give its importance.
(Multan Board-New Scheme-Group-I-2018-A)

Sol. A) Crossing Over: -
Crossing over is an exchange of segments between non-sister chromatids of homologous chromosomes during meiosis.

B) Importance of Crossing Over: -
Crossing over produces genetic variations among offspring. Genetic variations lead to tremendous variations in their traits. Variations provide raw material for evolution by letting them adapt successfully to the changing environment.

26. What are Sex Chromosomes?
(Bahawalpur Board-New Scheme-2015-A)

Sol. Sex Chromosomes: -

a. The chromosomes which determine the sex of an individual are known as Sex Chromosomes.
b. Usually there is one pair of sex chromosomes which are different in males and females.
c. The other chromosomes of an individual that do not deterime the sex are similar in males and females and are called autosomes.
d. Sex chromosomes were discovered by T. H Morgan in 1911 in Drosophila. He noticed out of four pirs of chromosomes, three pairs were similar in both sexes (called autosomes) while the fourth pair was very Different. The female had two rod shaped chromosomes (which he called X chromosomes) in the fourth pair while the male had one reod shaped chromosome (i.e. X chromosome) but other was hook or j shaped (which he called Y chromosome).

Example:
Humans have 46 chromosomes in the form of 23 pairs. 22 pairs are similar in both sexes and are called autosomes, while the 23rd pair of chromosome called sex chromosome is very different in males and females. A human female (woman has two similar chromosomes in her 23rd pair but the human male (man) has an X chromosome along with a much shorter Y chromosome containg SRYgene determining maleness in his 23rd pair.

27. What are Jumping Genes?
(Bahawalpur Board-New Scheme-2016-A)

Sol. Jumping Genes: -
Jumping genes are the genes that do not settle peacefully on their loci, instead, they keep on hopping on different loci on the same chromosome or other chromosomes.

28. Differentiate between Population and Gene Pool.
(Bahawalpur Board-New Scheme-2017-A)(Fsd-18A)

Sol. Differences Between Population and Gene Pool: -

Population	Gene Pool
Any group of interbreeding organisms of the same species that exist together in both time and space is called a population.	All the genes/alleles found in a breeding population at a given time are collectively the gene pool.

29. Differentiate between Complete Dominance and Co-dominance.
(Bahawalpur Board-New Scheme-2018-A)

Sol. Differences Between Complete Dominance and Co-Dominance: -

Compete Dominance	Co- dominance
1. Complete dominance is the condition in which one allele on a locus is always completely dominant over the other, with the result that it always masks the	1. Co-dominance is a condition in which two different alleles of a particular gene on a locus are expressed together in a heterozygote.

expression of other when both are present in a heterozygote. **Example: -** The one example of complete dominance is the allele controlling tallness of a pea plant (i.e. T) called dominant allele always masks the expression of allele for dwarfness (i.e. t) called recessive allele when both are present in a heterozygote.	2. In case of MN blood group, the allele L^M produces M antigen on RBC and L^N produces N antigen. When both these alleles are together (L^M and L^N) in a heterozygote, both M an N antigens are produced.

30. What is test cross?
(Faisalabad Board-New Scheme-2015-A)

Sol. Test Cross: -

a. The crossing of dominant individuals with their homozygous recessives, to determine wether they are homozygous or heterozygous, is known as Test cross.
b. Offspring that show the dominant character are alike phenotypically but may be either homozygous or heterozygous for that character. To determine their genotype test cross is used.
c. When dominant homozygous parent is crossed with its recessive, all the offspring will be dominant. But, when cross is between heterozygous dominant with recessive, then half dominant and half recessive offspring are produced.

31. What is over dominance?
(Faisalabad Board-New Scheme-2015-A)

Sol. Over Dominance: -

a. It is the dominance relation in which the over dominant heterozygote exceeds in quantity the phenotypic expression of both the homozygotes.
b. For example, in fruit fly *Drosophila* the heterozygote (w^+/w) has more quantity of fluorescent pigments in eyes than wild (w+/w) or white eye (w/w).

32. Define product rule and pseudoautosomal genes.
(Faisalabad Board-New Scheme-2016-A)

Sol. A) Product Rule: -
It is the rule for combining the probabilities of independent events by multiplying their individual probabilities.

B) Pseudoautosomal Genes: -

a. The genes which are present on X and Y both are called pseudoautosomal genes.
b. They are also called X- and –Y linked genes.
c. Their pattern of inheritance is like autosomal genes.

Example: -
Bobbed gene in *Drosophila* is an example of pseudoautosomal gene.

33. A man is 45 years old and bald. His wife also has pattern baldness. What is the risk that their son will lose his hair?(Faisalabad Board-New Scheme-2016-A)

Sol. Activity: -
A man is 45 years old and bald. His wife also has pattern baldness. What is the risk that their son will lose his hair?
The risk of their son to lose his hair will be 100 % because he gets the baldness gene from her mother.

34. Why is blood group AB called as universal recipient?
(Faisalabad Board-New Scheme-2017-A)

Sol. Blood Group AB Called as Universal Recipient: -
AB blood group individuals are called as universal recipients because they can receive transfusions of blood from any of the four blood groups.

35. Define Codominance.
(Rawalpindi Board-New Pattern-2014-A)

Sol. Codominance: -

a. Co-dominance is a condition in which two different alleles of a particular gene on a locus are expressed together in a heterozygote.
b. Different alleles of a gene that are both expressed in a heterozygous condition are called codominant.
c. For example, if allele A_1 produces substance X and allele A_2 produces substance Y, e.g.,
Allele A_1 ---------- Substance X
Allele A_2 ---------- Substance Y
Co-dominance occurs when both the alleles express independently in heterozygote (A_1, A_2) and form their respective products X and Y. The co-dominant heterozygote would have both substances at the same time.

Examples: -

a. In case of MN blood group, the allele L^M produces M antigen on RBC and L^N produces N antigen. When both these alleles are together (L^M and L^N) in a heterozygote, both M an N antigens are produced.
b. The human ABO blood group is an excellent example of codominant allele. Blood types A, B, AB and O are controlled by three alleles I^A, I^B and i representing a single locus. Allele I^A codes for the synthesis of a specific glycoprotein, antigen A, which is expressed on the surface of RBCs. Allele I^B leads to antigen B. Allele i does not code for any antigen. Neither allele I^A nor allele I^B is dominant to other. Both alleles are exressed henotypically in the heterozygote producing both A and B antigens, and are therefore codominant to each other, although each is dominant to allelei.

36. Differentiate between Linkage and Crossing over.
(Rawalpindi Board-New Pattern-2015-A)

Sol. Differences Between Linkage and Crossing Over:

Linkage	Crossing Over
1. It is the phenomenon of staying together of all the genes of a chromosome. 2. Gene linkage minimizes the chances of genetic recombination and variations among offspring.	1. Crossing over is an exchange of segments (genes) between non-sister chromatids of homologous chromosomes during meiosis hence is the phenomenon of separation of genes. 2. Crossing maximizes the chances of genetic recombination and variations among offsprings.

37. What do you know about protanopia and deuteranopia?
(Rawalpindi Board-New Pattern-2016-A)

Sol. Protanopia and Deuteranopia: -

A) Protanopia: -

a. It is red blindness.
b. It is caused due to lack of red opsin in the cone cells in the retina.
c. Lacking of red opsin in the cone cells is due to mutation in the red opsin gene present on X-chromosome.

B) Tritanopia: -

a. It is blue blindness.
b. It is caused due to lack of blue opsin in the cone cells in the retina.
c. Lacking of blue opsin in the cone cells is due to

38. Differentiate between genotype and phenotype.
(Rawalpindi Board-New Pattern-2018-A)

Sol. See Exrcise Chapter No: 22 Answer No: 1 (a)

39. What is a test cross? Who devised it?
(Rawalpindi Board-New Pattern-2018-A)

Sol. A) Test Cross: -
Cross fertilization of a phenotypically dominant individual with a homozygous recessive individual is called a test cross.

B) Who Devised Test Cross: -
Mendel devised test cross.

40. Differentiate between co-dominance and over dominance. (Rawalpindi Board-New Pattern-2018-A)

Sol.

Co-Dominance	Over-Dominance
It is the phenomenon of inheritance in which both alleles of a contrasting character are dominant and express themselves in heterozygous individual neither masking the effect of each other. **Example: -** In case of MN blood group, the allele L^M produces M antigen on RBC and L^N produces N antigen. When both these alleles are together (L^M and L^N) in a heterozygote, both M an N antigens are produced.	Over dominance is the condition in which the over dominant heterozygote exceeds in quantity the phenotypic expression of both the homozygotes. **Example:** In fruit fly *Drosophila* the heterozygote (w+/w) has more quantity of florescent pigments in eyes than wild (w+/w+) or white eye (w/w).

41. What is Test Cross? Give its significance.
(Sahiwal Board-New Scheme-2014-A)

Sol. Test Cross and its Significance: -

a. The crossing of dominant individuals with their homozygous recessives, to determine whether they are homozygous or heterozygous, is known as Test cross.
b. Offspring that show the dominant character are alike phenotypically but may be either homozygous or heterozygous for that character. To determine their genotype test cross is used.
c. When dominant homozygous parent is crossed with its recessive, all the offspring will be dominant. But, when cross is between heterozygous dominant with recessive, then half dominant and half recessive offspring are produced.

42. Enlist the types of color blindness.
(Sahiwal Board-New Scheme-2015-A)

Sol. List of the Types of Color Blindness: -

a. Protanopia ------- Red blindness
b. Tritanopia -------- Blue blindness
c. Deuteranopia ---- Green blindness
d. Blue cone mononchromacy -- Red and green blindness

43. Define gene and locus.
(Sahiwal Board-New Scheme-2016-A)

Sol. A) Gene: -
Gene is a basic unit of heredity. It is sequence of DNA nucleotides on a chromosome that encodes a protein, tRNA or rRNA molecules or regulates the transcription of such a sequence.

B) Locus: -
Locus is the position of a gene on the chromosome.

44. What are pseudoautosomal genes?
(Sahiwal Board-New Scheme-2016-A)

Sol. Pseudoautosomal Genes: -

a. The genes which are present on X and Y both are called pseudoautosomal genes.
b. They are also called X- and –Y linked genes.
c. Their pattern of inheritance is like autosomal genes.
Example: -
Bobbed gene in *Drosophila* is an example of pseudoautosomal gene.

45. Differentiate between multifactorial and polygenic traits. (Sahiwal Board-New Scheme-2017-A)

Sol.

Polygenic Traits	Multifactorial Traits
Polygenic traits are determined by more than one gene at different loci, each gene providing a small but additive effect.	Multifactorial traits are determined by interactions between a gene or genes and the environment.

46. What is co-dominance? (DGK-II-17A, Rwp-14A)
(Sahiwal Board-New Scheme-2018-A)

Sol. Co-Dominance: -

a. Co-dominance is a condition in which two different alleles of a particular gene on a locus are expressed together in a heterozygote.
b. Different alleles of a gene that are both expressed in a heterozygous condition are called codominant.
c. For example, if allele A_1 produces substance X and allele A_2 produces substance Y, e.g.,
Allele A_1 ---------- Substance X
Allele A_2 ---------- Substance Y
Co-dominance occurs when both the alleles express independently in heterozygote (A_1, A_2) and form their respective products X and Y. The co-dominant heterozygote would have both substances at the same time.
Examples: -
a. In case of MN blood group, the allele L^M produces M antigen on RBC and L^N produces N antigen. When both these alleles are together (L^M and L^N) in a heterozygote, both M an N antigens are produced.

b. The human ABO blood group is an excellent example of codominant allele. Blood types A, B, AB and O are controlled by three alleles I^A, I^B and i representing a single locus. Allele I^A codes for the synthesis of a specific glycoprotein, antigen A, which is expressed on the surface of RBCs. Allele I^B leads to antigen B. Allele i does not code for any antigen. Neither allele I^A nor allele I^B is dominant to other. Both alleles are exressed henotypically in the heterozygote producing both A and B antigens, and are therefore codominant to each other, although each is dominant to allele i.

47. What are multifactorial traits? Give example.
(Azad Jammuu Kasmir Board -2017-A)

Sol. A) Multifactorial Traits: -
Multifactorial triats are the traits that are determined by interactions between a gene or genes and the environemnt and do not exibit Mendelian ratios.

B) Example: -
Blood pressure is an example of multifactorial trait. It is controlled by genes and also influenced by environmental factors such as diet, stress and tension.

SECTION III

LONG QUESTIONS

1. Describe the genetics of color blindness. In humans (4)
(DGK-II-16, Lhr-I-16A, Sah-14A, Grw-15A, Mtn-14A, Sgd-18, 16A)
(Lahore Board-Session-2012-2014-Group-I-2014-A)
3. Describe the phenomenon of gene linkage. (4)
(Lahore Board-New Scheme-Group-I-2015-A)
5. Define and explain Mendel's Law of Segregation. (4)
(Bwp-17A)
(Lahore Board-New Scheme-Group-II-2016-A)
6. Explain indetil diabetes mellitus and its types. (4)
(DGK-II-17A, Fsd-18A)
(Lahore Board-New Scheme-Group-I-2017-A)
7. Explain the ABO blood group system. (4)
(Mtn-II-18A)
(Lahore Board-New Scheme-Group-I-2018-A)
8. Write a short note on multiple alleles. (4)
(Fsd-14A, Sgd-17A)
(Gujranwala Board-New Scheme-2014-A)
9. Discuss MN-Blood group type/system in detail. (4)
(Gujranwala Board-New Scheme-2016-A)
10. Write a note on incomplete dominance. (4)
(DGK-I-16, 17, II-18, Bwp-14A, Rwp-16-17A, Mtn-17A, 18)
(Gujranwala Board-New Scheme-2018-A)
11. Write a note on Rh Blood group system. (4)
(Multan Board (Old Scheme) (2014-A)(Bwp-16A)
13. Discuss sex-linkage in humans with one example. (4)
(Multan Board-New Scheme-2016-A)(Lhr-II-18)
14. What is Erythroblastosis Foetalis? Write briefly. (4)
(Multan Board-New Scheme-Group-II-2017-A)(Fsd-16A)
15. Describe XO-XX and XY-XX type patterns of sex determination. (4)
(Bahawalpur Board-New Scheme-2015-A)
19. Explain codominance with the help of MN blood group system man. (4)
(Rawalpindi Board-New Pattern-2014-A)
20. Explain pleiotropy with the help of examples. (4)
(Rawalpindi Board-New Pattern-2015-A)
21. Describe the Mendel's Law of Independent Assortment with a an example. (4)
(D.G.K. Board-New Course-Group-II-2014-A)(DGK-II-15A)
22. Describe genetics of Hemophilia. (4)
(D.G.K. Board-New Course-Group-I-2018-A)
24. Define and explain test cross. Also give its significance. (Grw-17A, Rwp-18A, Sgd-14A, DGK-I-14A) (4)
(Azad and Jammu Kashmir Board-2017-A)

Chapter ---- 23

BIOTECHNOLOGY

I MCQ

I) From Exercise:-

1) Which of these is a true statement?
a) **Both plasmids and viruses can serve as vector.**
b) Plasmids can carry recombinant DNA but viruses can not.
c) Vectors can carry only the foreign gene into the host cell.
d) Only gene therapy uses vectors.
e) Both c and d are correct.

2) Which of these is a benefit to having insulin produced by biotechnology?
a) It is just as effective
b) It can be mass produced
c) It is non-allergic
d) It is less expensive
e) All of these are correct

3) Restriction fragment length polymorphism (RFLPs):
a) Are achieved by using restriction enzymes
b) Identify individuals genetically
c) Are the basis for DNA finger prints
d) Can be subjected to gel electrophoresis
e) All of these are correct

4) Which of these would you not expect to be a biotechnology product?
a) Vaccine
b) Modified enzyme
c) DNA probes
d) Protein hormones
e) Steroid hormones

5) What is the benefit of using a retrovirus as a vector in gene therapy?
a) It is not able to enter cells.
b) It incorporates the foreign gene into the host chromosome.
c) It eliminates a lot of unnecessary steps
d) It prevents infection by other viruses
e) Both b and c are correct

6) **Gel electrophoresis:**
   a) Can not be used on nucleotides
   b) Measures the size of plasmids
   c) Tells whether viruses are infectious
   d) Measure the change and size of proteins and DNA fragments
   e) All of these are correct

7) **Which of these is incorrectly matched?**
   a) Protoplast - Plant cell engineering
   b) RFLPs ----- DNA finger printing
   c) DNA polymerase --- PCR
   d) DNA ligase -- Mapping human chromosomes

II) From Punjab Boards:-

1) **In 1958, F.C. Steward grew a complete carrot plant from tiny piece of:**
   (Lahore Board-New Scheme-Group-II-2014-A)
   a) Pith b) Cortex
   c) Xylem **d) Phloem**

2) **The two different pieces of DNA joined together, is called as:**
   (Lahore Board-New Scheme-Group-I-2015-A)
   a) Dimeric DNA **b) Chimaeric DNA**
   c) Trimeric DNA d) Tetrameric DNA

3) **Antibody used for the treatment of general herpes is obtained from:**
   (Lahore Board-New Scheme-Group-II-2015-A)
   a) Corn **b) Soy-bean**
   c) Rice d) Wheat

4) **Patients of cystic fibrosis often die due to numerous infections of the: (DGK-I-18)**
   (Lahore Board-New Scheme-Group-I-2017-A)
   a) Respiratory tract b) Excretory tract
   c) Digestive tract d) Reproductive tract

5) **Cystic fibrosis patients lack a gene that codes for a trans-membrane carrier of:**
   (Mtn-II-18, Bwp-18, Fsd-14, DGK-I-15, Sah-18A)
   (Lahore Board-New Scheme-Group-II-2018)
   a) Sodium ion b) Potassium ion
   c) Corbonate ion **d) Chloride ion**

6) **EcoR1 is a commonly used:**
   (Gujranwala Board-New Scheme-2015-A)
   a) Gene **b) Restriction enzyme**
   c) Bacteriophage d) Bacteria

7) **The use of transgenic form animals to produce pharmaceutical is termed as:**
   (Gujranwala Board-New Scheme-2016-A)
   a) Gene therapy b) Genetic drift
   c) Gene farming **d) Gene pharming**

8) **The Polymerase Chain Reaction (PCR) was developed in 1983 by:**
   (Multan Board-New Scheme-2014-A)
   a) Kary B. Mullis b) Gottlieb Haberlandt
   c) Theodore M. Klein d) J. Craig. Venter

9) **Persons with Huntington's disease have a unique site where a restriction enzyme cuts:**
   (Multan Board-New Scheme-2016-A)
   a) DNA b) RNA
   c) Lipids d) Proteins

10) **Hamilton O. Smith isolated the first restriction enzyme in:**
    (Multan Board-New Scheme-Group-I-2017-A)
    a) 1950 b) 1960
    c) 1970 d) 1980

11) **Taq polymerase is obtained from:**
    (Multan Board-New Scheme-Group-II-2017-A)
    (LHr-I-16, Sah-14)
    a) Fungi b) Algae
    c) Bacteria d) Virus

12) **An enzyme α- galactosidae that can be used to treat a human lysosome storage disease, is harvested from:**
    (Multan Board-New Scheme-Group-I-2018-A)
    a) Soyabeans **b) Tobacco plants**
    c) Sugarcane d) Corn plants

13) **Cases of disputed parenthood can be solved with the help of:**
    (Bahawalpur Board-New Scheme-2014-A)
    a) DNA finger printing b) RNA finger printing
    c) Cloning d) Gene sequencing

14) **pBR 322 has antibiotic resistance genes for:**
    (Bahawalpur Board-New Scheme-2015-A)
    a) Tetracycline and Ampicillin
    b) Tetracycline only
    c) Ampicillin only
    d) Streptomycin only

15) **To cure Parkinson's Disease, Dopamine producing cells could be grafted directly into the:**
    (Bahawalpur Board-New Scheme-2017-A)
    a) Brain b) Liver
    c) Bone marrow d) Blood

16) **Genome fragments can be separated according to their lengths during the process:**
    (Faisalabad Board-New Scheme-2016-A)
    a) Catalphoresis b) PCR
    c) Cloning **d) Gel electrophoresis**

17) **The first restriction enzyme was isolated by:**
    (Faisalabad Board-New Scheme-2018-A)(Rwp-I-17)
    a) Kary Mulis **b) Hamilton O. Smith**
    c) Sanger d) Maxam Gilbert

18) **It makes bacterial cell more permeable to take up recombinant plasmids:**
    (Rawalpindi Board–New Pattern-2014-A)
    a) Sodium chloride b) Cecium chloride
    c) Calcium chloride d) Potassium chloride

19) **Which of the enzymes act molecular scissors?**
    (Rawalpindi Board –New Pattern-2015-A)(Sah-15,17)
    a) DNA ligase **b) Restriction endonucleases**
    c) DNA polymerase d) RNA polymerase

20) **Primer for PCR contains about:**
    (Rawalpindi Board –New Pattern-2018-A)
    a) 05 bases **b) 10-20 bases**
    c) 30 base d) 40 bases

21) **Antithrombin III is a biotechnical product produced in:**
    (Sargodha Board-New Scheme-2016-A)
    a) Sheep **b) Goat**
    c) Mice d) Cow

22) The cells which cling to an egg after ovulation occurs are called:
(Sargodha Board-New Scheme-2017-A)
a) Ovarian cells b) Follicle cells
c) Cumullus cells d) Uterine cells

23) The enzyme Luciferase is produced by an insect commonly known as:
(Sargodha Board-New Scheme-2018-A)
a) House fly b) Butter fly
c) Caddis fly **d) Fire fly**

24) Recombinant DNA is introduced into the host cell by means of a:
(D.G.K Board-New Scheme-Group-I-2014-A)
a) Vector b) Phage
c) Bacterium d) Fungus

25) The enzyme which joins two pieces of DNA, is:
(D.G.K Board-New Scheme-Group-II-2014-A)
a) DNA polymerase I **b) DNA ligase**
c) Restriction endonuclease
d) DNA polymerase III

26) Adult transgenic tobacco plants glowed when sprayed with the substrate:
(D.G.K Board-New Scheme-Group-II-2015-A)
a) Luciferin b) Myoglobin
c) Haemoglobin d) Methionine

27) Antibody made by soyabeans can be used as treatment for:
(D.G.K. Board-New Scheme-Group-I-2016-A)
a) AIDS b) Herpes Simplex
c) Genital Herpes d) Hepatitis C

28) Organisms that have had a foreign gene inserted into them are called:
(D.G.K. Board-New Scheme-Group-II-2016-A)
a) Trangenic organisms
b) Hermaphrodites
c) Polygenosis
d) Transmuted organsims

29) The coconut milk contains the plant hormone called:
(D.G.K. Board-New Scheme-Group-I-2017-A)
a) Auxin **b) Cytokinins**
c) Gibberellins d) Abscisic acid

30) Meristem is:
(D.G.K. Board-New Scheme-Group-II-2018-A)
a) Virus free b) Bacteria free
c) Fungus free d) Pathogen free

31) Urine is preferable vehicle for a biotechnological product than:
(Sahiwal Board-New Scheme-2016-A)
a) Milk b) Blood
c) Plasma d) Tissue fluid

III) From Entry Test:-

2) In recombinant DNA technology ---------- are tools for manipulating DNA. **(Entry Test-2012)**
a) Viruses **c) Enzymes**
b) Chromosoms d) Genes

3) In DNA finger printing, the use of ---------- produces distinctive pattern of autoradiography or x-ray film. **(Entry Test-2012)**
a) Restriction enzymes
b) Microsatellites
c) Macrosatellites
d) Probes for genetic matker

4) In the recombinant DNA technology, plasmids are used as: **(Entry Test-2012)**
a) Genetic material **c) Vectors**
b) Enzymes d) Probes

5) In which process multiple copies of desired genes are produced? **(Entry Test-2012)**
a) Polymerase chain reaction
b) Gene sequencing
c) Analyzing DNA
d) DNA finger printing

6) The enzyme adenosine deaminase is missing in persons suffering from: **(Entry Test-2012)**
a) Cystic fibrosis
b) Hypercholesterolemia
c) Severe combined immunodeficiency syndrome
d) Parkinson's disease

7) Enzymes restriction endonucleases were isolated from: **(Self-Test Questions-2013-2017)**
a) Viruses c) Fungi
b) Bacteria d) Protozoa

8) During polymerase chain reaction, how DNA double helix is separated:
(Self-Test Questions-2013)
a) By heat treatment
b) By use of enzyme DNA polymerase
c) By use of enzyme DNA Helicase
d) By use of enzyme DNA ligase

9) Which enzyme is used to join the desired gene into the plasmid DNA during genetic engineering?
(Self-Test Questions-2013)
a) DNA Helicase c) DNA polymerase
b) DNA Ligase d) Taq polymerase

10) Which of the following is an example of benefits of transgenic organisms produced through genetic engineering? **(Self-Test Questions-2013)**
a) Production of antibiotics
b) Production of insulin
c) Production of anti-rabies vaccine
d) Production of anti-malarial drugs

11) In cystic fibrosis transmission of which ion is faulty, resulting into the production of disease?
(Self-Test Questions-2013)
a) Chloride c) Calcium
b) Flouride d) Magnesium

12) The DNA molecule formed from messenger-RNA by reverse transcriptase is called:
(Entry Test-2013)
a) Complementary DNA c) Chimeric DNA
b) Recombinant DNA d) Plasmid DNA

13) **The agent which separates the two strands of DNA in PCR is:** **(Entry Test-2013)**
a) DNA ligase **c) Heat**
b) Primer d) Helicase

14) **Cystic fibrosis patient lacks a gene that codes for trans-membrane carrier of:** **(Entry Test-2013)**
a) Na^+ ions c) Ca^{++} ions
b) Cl^- ions d) K^+ ions

15) **The phage commonly used as a vector in genetic engineering is:** **(Entry Test-2013)**
a) Lambda phage c) T_2 phage
b) Gamma phage d) T4 phage

16) **pBr 322 have antibiotic resistant gene for:** **(Entry Test-2014)**
a) Ampicillin and aspirin
b) Streptomycin and metroindizole
c) Ampicillin and Tetracycline
d) Pencillin and metraindizole

17) **Cystic Fibrosis affects which one of the cells of the body?** **(Entry Test-2014)**
a) Epithelial cells c) Plasma cells
b) Endothelial cells d) Blood cells

18) **The enzymes which act as molecular scissors in recombinant DNA technology is:** **(Entry Test-2014)**
a) Exonucleases **c) Endonucleases**
b) Polymerases d) Reverse transcriptase

19) **Which of the following is the correct sequence of PCR?** **(Entry Test-2014)**
a) Heating ⟶ Cooling ⟶ Add Primer ⟶ Copying of strand
b) Heating ⟶ Add Primer ⟶ Cooling ⟶ Copying of strand
c) Add Primer ⟶ Heating ⟶ Cooling ⟶ Copying of strand
d) Cooling ⟶ Add Primer ⟶ Heating ⟶ Copying of strand

20) **In cyctic fibrosis, liposomes-microscopic vesicles are used which are coated with: (Entry Test- 2015)**
a) Healthy Genes c) Protein
b) Chromosome d) Carbohydrate

21) **The DNA formed by the reverse transcription is called: (Entry-Test-2015)**
a) rDNA **c) cDNA**
b) dDNA d) DNA

22) **Bacterial cells take up recombinant plasmids when they are treated with: (Entry Test-2015)**
a) $CaCl_2$ c) KCl
b) NaCl d) NaOH

23) **Which one of the following is made up of radioactively labelled nucleotides?** **(Entry Test-2015)**
a) Phage DNA c) Recombinant DNA
b) Genomic library **d) Gene probe**

24) **A technique in transgenic animals in which desired gene is inserted into the eggs of animal is called:** **(Entry Test-2015)**
a) Embryonic Stem Cell mediated Transfer
b) Microinjection
c) Retrovirus mediated gene transfer
d) Virus vectors

25) **The modified plasmid or phage DNA is called:** **(Entry Test-2014-2016)**
a) Clone DNA **c) cDNA**
b) Recombinant DNA d) rDNA

26) **Restriction enzyme EcoR1 cuts DNA to produce:** **(Entry Test-2017)**
a) Blunt ends **c) Sticky ends**
b) Non-palindromic ends d) Split ends

27) **DNa segments of different lengths can be separated by a process of:** **(Entry Test-2017)**
a) Western blotting c) Autoradiography
b) Northern blotting **d) Gel electrophoresis**

28) **The ---------- is the first heat stable component used in PCR.** **(Entry Test-2017)**
a) Taq-isomerase **c) Taq-polymerase**
b) Taq-helicase d) Taq SSBp

29) **Patients of cystic fibrosis (CF) produce thick mucus because of faulty: (Entry Test-2017)**
a) Trans-membrane carrier
b) Cl^- ions
c) Na^+ ions
d) Mucus membrane

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. How and why transgenic animals that secrete a product are often cloned?

Sol. A) How: -

Following steps take place cloning of transgenic animals:

a. 2n nuclei of transgenic animal (goat) are transferred into enucleated donor eggs by microinjection.
b. These eggs are then transferred into the uterus of host goats where development occurs.
c. Host goats give birth to cloned transgenic goats which produce biotechnology product in their milk.

B) Why: -

Transgenic animals are often cloned to obtain the product in a very large scale.

3. Explain and give examples of ex vivo and in vivo gene therapies in humans.

Sol. A) Ex-Vivo Therapy With Example: -

1. In Ex-vivo gene therapy, cells are modified outside the body and then transplanted back in again.
2. Following steps take place in Ex-vivo gene therapy:

a. Bone marrow stem cells are removed.
b. These bone marrow stem cells are infected with a retrovirus carrying a normal gene to bring it into bone marrow stem cells.

c. Genetically engineered bone marrow stem cells are returned to patients. The patients usually show better improvement after this therapy.
Example: -
The first complete cure of Severe Combined Immunodeficiency Syndrome (SCID) was achieved in 2000 in Paris through Ex-vivo gene therapy.

B) In-Vivo Therapy With Example: -

1. In In-vivo gene therapy, genes are inserted into cells in the body.
2. An In-vivo method of treatment is being tried in case of cystic fibrosis (a heredity disease in which often die due to numerous infections of the respiratory tract). Liposomes-microscopic vesicles (that spontaneously form when lipoproteins are put into a solution) have been coated with the gene needed to cure cystic fibrosis. Then the solution is sprayed into patients's nostrils. Due to limited gene transfer, this methodology has not yet been successful.

II) From Punjab Boards:-

1. What is probe? Give its use.
(Grw-19A, Mtn-15A, DGK-I-16A, Rwp-16A, Sgd-16A)
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. A) Probe: -
Probe is usually a radioactively labeled or inflorescent segment of single stranded DNA that can hybridize—become attached by base pairing—to complementary base sequence in the target gene.

B) Use of Probe: -
A particular can be used to search a genomic library for a certain gene. Bacterial cells, each carrying a particular DNA fragment, can be plated onto agar in a petri dish. After the probe hybridizes into the gene of interest, genes can be isolated from the fragment.

2. Differentiate between plasmids pSC 101 and pBR322.
(Lahore Board-New Scheme-Group-I-2014-A)

Sol.

pSC101	pBR322
1. It is a plasmid that has antibiotic resistance gene for tetracycline. 2. It is a smaller plasmid.	1. It is a plasmid that has antibiotic resistance genes for tetracycline as well as ampicillin. 2. It is a larger plasmid.

3. What are transgenic plants? (Lhr-I-15A, Bwp-18A)
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. Transgenic Plants: -

a. The plant in which foreign genes have been incorporated is referred to as transgenic plant.
b. Techniques have developed to introduce foreign genes into immature plant embryos or into plant cells called protoplast that have had the cell wall removed.
c. Transgenic plants are increasingly important in agriculture. Foreign genes transferred to cotton, corn, potato strains have been made plants resistant to pests.
d. Plants are also being engineered to produce proteins, such as hormones, clotting factors, and antibodies in their seeds.

4. What is recombinant DNA? (Mtn-II-18A, Fsd-15A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Recombinant DNA: -
It is the DNA that has been produced by artificially combining DNA from different organisms.

5. What are palindromic sequences?
(Lhr-II-19A, Sah-17A, Ajk-17A, Sgd-18A, DGK-II-14A, Lhr-II-16A-II-18A, Grw-18A, Mtn-II-17A
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Palindromic Sequences: -

a. Palindromic means reading the same forward and backward.
b. Palindromic sequences are sequences of four or six nucleotides on the DNA duplex that "read" the same way in either direction on opposite strands.
c. They always read in $5' \longrightarrow 3'$ direction.
d. Restriction enzyme cleaves a DNA duplex molecule at a particular base sequence, usually within or near a palindromic sequence.
Example: -
The six nucleotide palindromic sequence recognized by Eco-R1 is GAATTC i.e.,
$5'$----- GAATTC ----- $3'$
$3'$----- CTTAAG ----- $5'$
It cuts this specific sequence of nucleotide in such a way that sticky ends are produced.

6. What is Taq Polymerase? (Mtn-14A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Taq Polymerase: -

a. *Taq polymerase* is a temperature insensitive (thermostable) DNA polymerase enzyme which has been extracted from the bacterium *Thermus aquaticus* living in hot springs.
b. It catalyzes the replication of DNA strands. It can withstand high temperature, which is used to separate double stranded DNA, therefore, replication need notbe interrupted by the need to add more enzyme.

7. Give three possible ways to get the gene of interest.
(Bwp-19A, Mtn-I-17A, 18A, Fsd-18A, DGK-II-15)
(Lahore Board-New Scheme-Group-I-2016-A)

Sol. Three Possible Ways To Get The Gene of Interest:-

a. To isolate gene of interest from the chromosomes by using restriction endonucleases.
b. To synthesize it chemically in the laboratory.
c. To make it from mRNA, using reverse transcriptase.

8. Compare ex-vivo gene therapy with in-vivo gene therapy.
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. See Bahawalpur Board Answer No: 11

9. Elaborate the uses of plasmids.
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Uses of Plasmids: -

a. It is a DNA molecule in which gene of interest is inserted to construct a recombinant DNA (rDNA).
b. It is capable of replication in host organism, hence it acts as a vehicle to transport recombinant DNA (rDNA) into host cell and is called vector in biotechnology.

10. What is gene pharming? (Grw-17A)
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. Gene Pharming: -

a. Producing transgenic live stock, such as pigs, sheep, cows and goats, that secrete foreign proteins in their milk is known as gene pharming.
b. Gene pharming (the combination of pharmaceuticals and farming) is the use of transgenic farm animals to produce pharmaceuticals.
c. Genes that code for therapeutic, and diagnostic proteins are incorporated into the animal's DNA and the proteins appear in the animal's milk.
d. Gene pharming is being persuited by a number of firms.

11. Define gene therapy. Name two main methods of gene therapy.
(Lahore Board-New Scheme-Group-II-2018-A)
(Grw-14A, Mtn-II-18A, DGK-II-18, Bwp-16A)

Sol. Gene Therapy and Names of Two Main Methods of Gene Therapy: -

a. Gene therapy is the insertion of genetic material into human cells for the treatment of a disorder.
b. It is correction of a faulty gene by the addition of new healthy gene and its insertion in a genome.
d. The healthy gene is deliverd either by viruses or liposomes or by direct injection.
e. There are two main types of gene therapy:

i. Ex-vivo --- In this type gene therapy, gene is inserted into the cells out side the body with the help of retroviruse and then transplanted back again.

ii. In-vivo --- In this type of gene therapy, genes are inserted into cells in the body.

12. Explain transgenic organisms.
(Gujranwala Board-New Scheme-2014-A)

Sol. Transgenic Organisms: -

a. Animal in which foreign genes have been incorporated is referred to as transgenic animal.
b. Transgenic animals are usually produced by injecting the DNA of a particular gene into the nucleus of a fertilized egg cell or of embryonic stem cells.
c. Another method of producing transgenic animals is the use of viruses as recombinant DNA vectors. RNAviruses called retroviruses make DNA copies of themselves by reverse transcription. Sometimes DNA copies become integrated into the host chromosomes, where they are replicated along with host DNA.
d. Transgenic animals provide valuable applications over a wide range research area, such as regulation of gene expression, immune system function, genetic diseases, viral diseases, and genes involved in the development of cancer.

13. What is cystic fibrosis?
(Gujranwala Board-New Scheme-2014-A)

Sol. Cystic Fibrosis: -

a. Cystic fibrosis patients lack a gene that codes for trans-membrane carrier of the chloride ion. Patients die due to numerous functions of the respiratory tract.
b. It is being treated by in-vivo gene therapy.

14. What are bioreactors?
(Rwp-19A, Mtn-16A, Rwp-II-17A, Sah-16A)
(Gujranwala Board-New Scheme-2014-A)

Sol. Bioreactors: -

Bioreactors are automatic large vats which produce an optimal environment for genetically engineered bacteria that make proteins for use in pharmaceutical products.

15. Differentiate between genome and probe.
(Gujranwala Board-New Scheme-2015-A)

Sol.

Genome	Probe
Genome is the entire DNA sequence of an organism.	A probe is a single stranded DNA with nucleotide sequence that will hybridize (pair) with a certain piece of DNA.

16. Define biotechnology. What are transgenic organisms?
(Gujranwala Board-New Scheme-2015-A)(Fsd-18A)

Sol. A) Biotechnology: -

a. Biotechnology can be defined as the use of living organisms for the welfare of mankind.
b. In broad terms, biotechnology is the use of a natural biological system to produce a product or to achieve an end desired by humans.
c. The building of biotechnology is standing on pillars of recombinant DNA technology (genetic engineering) – the manipulation of genetic material of any organism.

B) Transgenic Organisms: -

Transgenic organisms are free-living organisms in the environment that have had a foreign gene stably inserted into them.

17. What is gel electrophoresis?
(Gujranwala Board-New Scheme-2016-A)

Sol. Gel Electrophoresis: -

a. Gel electrophoresis is the technique for separating DNA fragments of different lengths, using an electric field in a porous gel.
b. 'Phoresis' means to carry, so 'electrophoresis' means to carry with electricity.
c. DNA has negatively charged phosphate groups, so in an electric field a polynucleotide moves towards the pole (anode). DNA fragments move through the sub-microscopic spaces of gel. Larger fragments encounter greater resistance and so move more slowly. As a result the DNA separates out into a series of bands, each band representing millions of fragments of identical length.
(Note: - Different kinds of gel have different pore sizes. *Agrose*, a purified form of agar, has large pores and is suitable for sorting longer fragments. *Polyacrylamide* has smaller pores and is suitable for shorter fragments and can be used to separate fragments differing in length by a single nucleotide).

18. What steps are involved to produce recombinant DNA? (Gujranwala Board-New Scheme-2016-A)

Sol. Steps Involved To Produce Recombinant DNA: -

a. Plasmid is cut with the restriction enzyme.
b. The gene of interest is also cut with the same enzyme.
c. The gene of interest is then joined with the plasmid with the help of another enzyme known as DNA ligase to form a recombinant DNA.

19. Discuss role of a particular probe. (Gujranwala Board-New Scheme-2017-A)

Sol. Role of a Particular Probe: -

The role of probe is the search of gene in the genomic library as it hybridizes (becomes attached by base pairing) to complementary base sequences in the target gene. The probe is then detected by radioautography using x-ray-film.

20. Why biotechnology is important for human beings? (Gujranwala Board-New Scheme-2017-A)

Sol. Importance of Biotechnology For Human Beings: -

a. Biotechnology enables genes to be removed from one organism and inserted into another to produce a desired substance, for example, insulin.
b. It is used to produce genetically engineered bacteria That have been successfully used to clean environmental pollutants, increase the fertility of the soil, and kill insect pests.
c. With the use of biotechnology, it has been possible to alter the phenotypes of plants and animals. Indeed genetherapy in humans, attempting to repair a faulty gene is already undergoing clinical trials.

21. What are restriction enzymes? (Lhr-I-18A, Sgd-17A, Bwp-17A, DGK-19A, I-15A) (Gujranwala Board-New Scheme-2018-A)

Sol. Restriction Enzymes: -

a. Restriction enzymes, also called restriction endonucleases, are the enzymes which are capable of recognizing and cutting a specific symmetrical nucleotide sequence in DNA (usually a palindromic sequence).
b. These are natural enzymes of bacteria, which cut down the viral DNA. They are called restriction enzymes because they restrict the growth of viruses.
c. First restriction endonuclease was isolated by Smith in 1970. Since then 400 such enzymes have been isolated.
d. These enzymes are frequently used in recombinant DNA technology and enables scientists to cut DNA from chromosomes in shorter fragments in a controlled way.
e. About 20 restriction enzymes are frequently used in recombinant DNA technology. EcoR1, a commonly used restriction enzyme (extracted from *Escherichia coli*, strain R) cuts double-stranded DNA when it has GAATTC (a palindromic sequence) at the cleavage site.
f. Restriction enzymes fall into two groups, according to the kind of ends they generate at the cutting site: Some produce staggered cuts and sticky ends.

ii. Others cut the two strands opposite each other generating blunt or flush ends.

22. Define Bioreactors. (Multan Board-New Scheme-2016-A)

Sol. A) Uses of Bioreacters: -

The use of a bioreactor is to provide a suitable environment in which organisms can efficiently produce a target product. In the bioreactor foreign gene is replicated and actively expressed producing a large amount of targeted protein product.

B) Names of a Few Products: -

a. Insulin
b. Human growth hormone
c. Tissue plasminogen activator
d. Haemophilic factor VIII
e. Hepatitis B vaccine

23. Give uses of Bioreacters. Name a few products. (Multan Board-New Scheme-Group-II-2017-A)

Sol.

24. Explain the importance of Gene Pharming? (Multan Board-New Scheme-Group-II-2017-A)

Sol. Importance of Gene Pharming: -

Gene pharming is used to produce drugs for the treatment of cystic fibrosis, cancer, blood diseases and other disorders.

Example: -

Antithrombin III, is currently been produced by a herd of goats. It is used for preventing blood clot during surgery.

25. What are Biofilters? (Bahawalpur Board-New Scheme-2014-A)

Sol. Biofilters: -

a. Biofilters are the organisms which absorb air born pollutants from the atmosphere.
b. Some bacteria can be used as biofilters to prevent airborne chemical pollutants from being vented into the air.

26. Define Palindromic Sequences and Sticky Ends. (Bahawalpur Board-New Scheme-2014-A)

Sol. A) Palindromic Sequences: -

These are the specific sequences of four or six nucleotides arranged symmetrically in the reverse order.

B) Sticky Ends: -

a. The single stranded but complementary ends of the two DNA molecules are called "sticky ends".
b. They can bind by complementary base pairing.
c. They facilitate the insertion of foreign DNA into vector DNA.

27. What are Restriction Endonucleases? (Lhr-I-19A, Rwp-15A, DGK-I-19A) (Bahawalpur Board-New Scheme-2015-A)

Sol. Restriction Endonucleases: -

a. Restriction enzymes, also called restriction endonucleases, are the enzymes which are capable of recognizing and cutting a specific symmetrical nucleotide sequence in DNA (usually a palindromic sequence).
b. These are natural enzymes of bacteria, which cut down the viral DNA. They are called restriction enzymes because they restrict the growth of viruses.

c. First restriction endonuclease was isolated by Smith in 1970. Since then 400 such enzymes have been isolated.
d. These enzymes are frequently used in recombinant DNA technology and enables scientists to cut DNA from chromosomes in shorter fragments in a controlled way.
e. About 20 restriction enzymes are frequently used in recombinant DNA technology. EcoR1, a commonly used restriction enzyme (extracted from *Escherichia coli*, strain R) cuts double-stranded DNA when it has GAATTC (a palindromic sequence) at the cleavage site.
f. Restriction enzymes fall into two groups, according to the kind of ends they generate at the cutting site: Some produce staggered cuts and sticky ends.
ii. Others cut the two strands opposite each other generating blunt or flush ends.

28. Differentiate between Genetherapy and Angeoplasty.
(Bahawalpur Board-New Scheme-2015-A)

Sol.

Geneterapy	Angioplasty
1. It is insertion of genetic material into human cells for the treatment of a disorder. 2. It occurs in vivo as well as in vitro.	1. It is opening up of a closed artery of heart. 2. It occurs in vivo.

29. What are Plasmids? Give example.
(Rwp-15A, DGk-II-17A)
(Bahawalpur Board-New Scheme-2017-A)

Sol. A) Plasmids: -
a. Plasmids are small extrachromosomal DNAs of Bacteria.
b. In Recombinant DNA technology they are used as vectors for making recombinant DNA.

B) Examples: -
a. pBr 322 ---- It has antibiotic resistance genes for tetra cycline and ampicillin.
b. pSC 101 ---- It has antibiotic resistance gene for tetracycline.

30. What is the advantage of PCR?
(Rwp-19A, DGK-II-19A, MTN-15A)
(Bahawalpur Board-New Scheme-2017-A)

Sol. Advantage of PCR: -
PCR can create millions of copies of a single gene or any piece of DNA quickly in a test tube. Earlier methods of obtaining multiple copies of a specific sequence of DNA were time consuming and expensive.

31. Why transgenic animals that secrete a product are often cloned? (Faisalabad Board-New Schem-2015-A)

Sol. Transgenic Animals Secreting a Product are Often Cloned: -
Transgenic animals are often cloned to obtain the product in a very large scale.

32. What is polymerase chain reaction?
(Faisalabad Board-New Scheme-2016-A)

Sol. Polymerase Chain Reaction: -
a. Polymeras Chain Reaction (PCR) is the method of in vitro, very rapid synthesis of million of copies of short, selected part of DNA between two regions whose sequences are known.
b. Kary B. Mullis developed PCR in 1983.
c. PCR is done these days in in an automatic machine or thermocycler.
d. Following steps take place in PCR:
i. DNA is heated to 95 ^{0}C to 30 seconds to denature the DNA, each strand being used as a tempelate to build the other strand.
ii. *Taq polymerase*, four nucleoside triphoshates and primers (with sequences of about 20 bases that are complementary to the bases on either side of the target DNA primers) are added.
iii. The mixture is cooled to 50^{0}-70^{0}C to allow the primers at either end of the DNA to be amplified.
iv. The DNA is replicated at a temperature of 70^{0}-75^{0}C producing two double-stranded molecules.
v. The DNA is heated again to denature and process repeated for 20-30 cycles. The second cycle produces four DNA molecules, the third produces eight, and so on.

33. What is recombinant DNA technology? (DGK-I-17A)
(Faisalabad Board-New Scheme-2016-A)

Sol. Recombinant DNA Technology: -
a. Recombinant DNA technology is the manipulation of genetic material of organisms for industrial, medical and research purposes.
b. It is popularly known as genetic engineering.
c. It aims at synthesizing recombinant DNA, which contains DNA from different sources. It usually utilizes bacterial cells and their plasmids which are small circular DNA molecule for making recombinant DNA. They can replicate freely within bacterial cells. DNA recombinant technology can produce cells that contain a foreign gene. These cells are capable of producing a new and different protein. As a result of growth of these cells, so many identical copies of plasmid with a foreign gene are produced.

34. What is ex-vivo gene therapy? For what purpose it is used?
(Faisalabad Board-New Scheme-2017-A)(Sah-19A)

Sol. A) Ex-Vivo Gene Therapy: -
It is a gene therapy in which cells are modified out side the body and then transplanted back again.

B) For What Purpose Gene Therapy Is Used: -
It is usually used for the treatment of SCID.

35. Write role of DNA ligase.
(Faisalabad Board-New Scheme-2017-A)

Sol. Role of DNA Ligase: -
In Recombinant DNA technology, DNA ligase is used to join the ends of plasmid and gene of interest to form recombinant DNA.

36. What is cloning of a gene?
(Faisalabad Board-New Scheme-2018-A)

Sol. Cloning of a Gene: -

1. Cloning of a gene is the production of many identical copies of a gene.
2. Recombinant DNA technology is used when a very large quantity of a gene is required.
3. Following steps take pace in gene cloning:

a. First, gene of interest is obtained either by isolating it from DNA by restriction endonucleases, by synthesizing chemically or by making it from mRNA.
b. Gene of interest is then placed into either plasmid of bacterium or DNA of a phage (vector) to prepare recombinant DNA or rDNA.
c. The gene of interest along with the vector (i.e. rDNA) is then introduced into an expression system usually a bacterium host, as aresult of which a specific product is made.
d. A gene of interst can be isolated from rDNA by hybridizing a particular probe. Now this particular fragment (gene of interest) can be cloned further or even analysed for its particular DNA sequence.

37. Why urine is preferable vehicle for bio-technology product? (Rawalpindi Board-New Pattern-2014-A) (DGK-II-19A)

Sol. Urine as a Preferable Vehicle for Bio-Technology Product: -

Urine is a preferable vehicle for bio-technology product than milk because:

a. All animals in a hard urinate while only females produce milk.
b. Animals start to urinate at birth while females donot produce milk until maturity.
c. It is easier to extract from urine than from milk.

38. Define hybridization. (SGD-17A) (Rawalpindi Board-New Pattern-2016-A)

Sol. Hybridization: -

a. Hybridization is the crossing of different varieties of plants or even species.
b. It is used to produce plants with desirable traits.
c. Hybridization, followed by vegetative propagation of the mature plants, generates a large number of identical plants with these traits.
d. Today hybridization has been replaced by genetic engineering, because today it is possible to directly alter the genes of organisms by recombinant DNA technology (genetic engineering).

39. Give two practical uses of DNA finger printing technology. (DGK-I-19A) (Rawalpindi Board-New Scheme-Group-I-2017-A)

Sol. Two Practical Uses of DNA Finger Printing Technology: -

a. DNA fingerprinting is used to settle disputes over parentage and other relationships.
b. It is also used to identify criminals from blood, semen, saliva, hair follicles etc. left at the scene of a crime.

40. How hypercholesterolemia can be cured by gene therapy?
(Rawalpindi Board-New Scheme-Group-I-2017-A)

Sol. Cure of Hypercholesterolemia By Gene Therapy:
In Hypercholesterolemia liver cells lack a receptor for removing cholesterol from the blood. It can be cured by gene therapy, firstly by surgically excising the small portion of patient liver and then infecting the liver with retrovirus containing normal gene. Several patients have experienced lowering of serum cholesterol levels following this procedure.

41. What is the use of dideoxyribonucleoside triphosphate?
(Rawalpindi Board-New Scheme-Group-II-2017-A)

Sol. Use of Dideoxyribonucleoside Triphosphate: -
Dideoxyribonucleoside Triphosphate is used to terminate the DNA strand elongation. This chain-terminating nucleotide lacks a $3'$ OH group required for the formation of a phosphodiester bond between two nucleotide causing DNA polymerase to cease extension of DNA. This nucleotide is radioactively or fluorescently labeled for detection in automatic sequencing machines.

42. What are transgenic bacteria?
(Rawalpindi Board-New Pattern-2018-A)

Sol. Transgenic Bacteria: -

a. Bacteria in which foreign genes have been incorporated is referred to as transgenic bacteria.
b. Transgenic bacteria can be used to produce biotechnology products such as insulin, human growth hormone etc, to be used to promote health of plants to make them resistant towards insects, as bioremediation (pollution cleaner), to detect metals, to enhance genetic research to produce pharmaceutical products.

43. Differentiate between probe and plasmid.
(Sargodha Board-New Scheme-2017-A)

Sol.

Probe	Plasmid
A probe is a small fragment of DNA or RNA used to detect target DNA or RNA in the sample by molecular hybridization.	Plasmid is a small circle of DNA found in bacteria and is vehicle for storing and studying genes.

44. Write two applications of polymerase chain reactions.
(Sargodha Board-New Scheme-2018-A)

Sol. Two Applications of Polymerase Chain Reactions:

a. To diagnose viral infections, genetic disorders, and cancer
b. In forensic laboratories to identify criminals

45. What is Genetic Engineering?
(D.G.K Board-New Scheme-Group-I-2014-A)

Sol. Genetic Engineering: -

a. Recombinant DNA technology is the manipulation of genetic material of organisms for industrial, medical and research purposes.
b. It is popularly known as genetic engineering.

c. It aims at synthesizing recombinant DNA, which contains DNA from different sources. It usually utilizes bacterial cells and their plasmids which are small circular DNA molecule for making recombinant DNA. They can replicate freely within bacterial cells. DNA recombinant technology can produce cells that contain a foreign gene. These cells are capable of producing a new and different protein. As a result of growth of these cells, so many identical copies of plasmid with a foreign gene are produced.

46. Give one cause and control of cystic fibrosis.
(D.G.K. Board-New Scheme-Group-I-2016-A)

Sol. A) One Cause of Cystic Fibrosis: -
Lack a gene that codes for trans-membrane carrier of the chloride ion in the patients

B) One Control of Cystic Fibrosis: -
Spray of solution with liposomes microscopic vesicles containing gene needed to cure cystic fibrosis (a method of ex-vivo gene therapy) is one control of cystic fibrosis.

47. How cancer patients are being treated by gene therapy?
(D.G.K. Board-New Scheme-Group-I-2017-A)

Sol. Treatment of Cancer Patients By Gene Therapy: -
During trial based gene therapy of cancer patients, genes are given to cancer patients either to make healthy cells more tolerant of chemotherapy or make tumors more vulnerable to them. Once the bone marrow stem cells were protected it was possible to increase the level of chemotherapy to kill the cancer cells.

48. Briefly write down Maxam Gillbert method of gene sequencing.
(D.G.K. Board-New Scheme-Group-I-2017-A)

Sol. Maxam Gillbert Method of Gene Sequencing: -
a. Maxam Gillbert Method of Gene Sequencing is a method of DNA sequencing developed by Maxam Gillbert in 1966-1977.
b. This method is based on nucleobase specific partial chemical modification of DNA and subsequent cleavage the DNA backbone at sites adjacent to the modified nucleotides.

49. Write functions of PCR and EcoR1.
(D.G.K. Board-New Scheme-Group-II-2017-A)

Sol. A) Function of PCR: -
PCR is typically used to amplify a specific gene, or portion of gene, so that we can study the function of gene or gene-region.

B) Function of EcoR1: -
EcoR I cuts the specific sequence of nucleotides on DNA in such a way the sticky ends of DNA are produced.

50. What is "severe combined immunodeficiency syndrome?
(D.G.K. Board-New Scheme-Group-II-2017-A)

Sol. Severe Combined Immunodeficiency Syndrome: -
a. Severe Combined Immunodeficiency Syndrome (SCID) is an extremely rare inherited condition in which an enzyme adenosine deaminase (ADA) is missing that is involved in the maturation of T and B cells, and hence immune system is non-functional.
b. The first complete cure of SCID was achieved by Ex-vivo gene therapy in 2000 in Paris. Bone marrow cells were extracted and infected with a retrovirus in which the normal gene had been inserted. Stem cells were returned to the patient. Children who have undergone this procedure do have a significant improvement in their immune function that is associated with rise in the level of ADA enzyme activity in the blood.

51. Define molecular cissors. How were they obtained?
(D.G.K. Board-New Scheme-Group-I-2018-A)

Sol. A) Molecular Scissors: -
Molecular scissors are the restriction endonucleases (enzymes) which cut the polynucleotide backbone of the DNA wherever they encounter a specific sequence of bases called a restriction site.

B) How Molecular Scissors are Obtained:
Molecular scissors were obtained from bacteria. They are natural enzymes of bacteria, which they use for their own protection against viruses.

52. What is in-vivo gene therapy? Give example.
(Sahiwal Board-New Scheme-2017-A)

Sol. In-Vivo Gene Therapy With Example: -
1. In In-vivo gene therapy, genes are inserted into cells in the body.
2. An In-vivo method of treatment is being tried in case of cystic fibrosis (a heredity disease in which often die due to numerous infections of the respiratory tract). Liposomes-microscopic vesicles (that spontaneously form when lipoproteins are put into a solution) have been coated with the gene needed to cure cystic fibrosis. Then the solution is sprayed into patient's nostrils. Due to limited gene transfer, this methodology has not yet been successful.

53. What is gene sequencing?
(Sahiwal Board-New Scheme-2018-A)

Sol. Gene Sequencing: -
a. Gene sequencing is the procedure by which sequence of nucleotides in DNA fragment is determined.
b. It is also known as DNA sequencing.
c. In the late 1970s, methods were developed that allowed the nucleotide sequence of any purified DNA fragment to be determined simply and quickly.
d. There are two DNA sequencing methods (Sanger's method and Maxam-Gilbert method) both are based on:
i. To generate pieces of DNA of different sizes all starting from the same point and ending at different points.
ii. Separation of these different pieces of DNA by size on agarose gel.
iii. Reading of nucleotide sequence directly from the gel.

54. Discuss Sanger's method of gene sequencing.
(Azad Jammuu Kasmir Board -2017-A)

Sol. Sanger's Method of Gene Sequencing: -
This method was developed by Sanger in late 1970 in which ideoxyribonucleoside triphosphate is used to terminate the DNA strand elongation. This chain-terminating nucleotide lacks a 3′ OH group required for the formation of a phosphodiester bond between two nucleotide causing DNA polymerase to cease extension of DNA. This nucleotide is radioactively or fluorescently labeled for detection in automatic sequencing machines.

SECTION III

LONG QUESTIONS

No Essay Type Question According to New Pattern

C h a p t e r ---- 24

EVOLUTION

1 MCQ

I) From Exercise:-

1) The gill pouches of mammals and birds' embryos are:
a) Supportive "Ontogony recapitulates phylogeny"
b) Homologous structures
c) Used by the embryos to breathe
d) Evidence for the degeneration of unused body parts

2) Darwin's theory, as represented in "The Origin of Species," mainly concerned:
a) How new species arise
b) The origin of life
c) How adaptations evolve
d) How extinctions occur
e) The genetics of evolution

3) The smallest biological unit that can evolve over time is:
a) A particular cell
b) An individual organism
c) A population
d) A species
e) An ecosystem

4) A gene pool consists of:
a) All the alleles exposed to natural selection
b) The total of all alleles present in a population
c) The entire genome of a reproducing individual
d) The frequencies of the alleles for a gene locus within a population
e) All the gametes in a population

7) Selection acts directly on:
a) Phenotype b) Genotype
c) The entire genome d) Each allele
e) The entire gene pool

II) From Punjab Boards:-

1) Archeobacteria can tolerate temperature about:
(Lahore Board-New Sacheme-Group-I-2014-A)
(Sah-18, Sah-19A, Fsd-17, Rwp-15A, Lhr-II-15, I-16)
a) 45 ^{0}C b) 85 ^{0}C
c) 100 ^{0}C **d) 120 ^{0}C**

2) Darwin's "Oigin of Species" was published in about:
(Lahore Board-New Scheme-Group-II-2014-A)(Fsd-18)
a) 1840 **b) 1859**
c) 1865 d) 1890

3) Emigration and immigration of members of a population, causes disturbance in the:
(Lahore Board-New Sacheme-Group-I-2017-A)
a) Genotype b) Genetic drift
c) Phenotype **d) Gene pool**

4) In natural selection, the environment plays role affecting the proportions of gene in:
(Gujranwala Board-New Scheme-2014-A)
a) Population b) Community
c) Area d) Biome

5) Zoos and botanical gardens are to save species extinction is:
(Gujranwala Board-New Scheme-2015-A)
a) Permanent b) Dominant
c) Imminent d) Prominent

6) Who published papers on inheritance?
(Gujranwala Board-New Scheme-2016-A)
a) Malthus b) Cuvier
c) Lyell **d) Mendel**

7) Change in frequency of alleles at a locus that occurs by chance is called:
(Gujranwala Board-New Scheme-2017-A)(Mtn-15A)
a) Genetic drift b) Mutation
c) Migration d) Non-ran dom mating

8) According to Endosymbiont Hypothesis, the aerobic bacteria developed into:
(Multan Board-New Scheme-2014-A)
a) Ribosome b) Lysosome
c) Mitochondria d) Golgi Apparatus

9) The scientist who published Principles of Geology was: (Lhr-II-19A)
(Multan Board-New Scheme-Group-I-2017-A)
a) Lamarck b) Linnaeus
c) Myell **d) Lyell**

10) In man the vestigial organ is:
(Multan Board-New Scheme-Group-II-2017-A)
a) Ear muscles b) Nictitating membrane
c) Nose bone d) Pelvis and leg bones

11) The first photosynthetic organisms probably used Hydrogen Sulphide as a source of Hydrogen reducing CO_2 to:
(Multan Board-New Scheme-Group-I-2018-A)
a) Sugars b) H_2CO_3
c) RUBP d) Malate

12) Acquired characters of an individual cannot be:
(Multan Board-New Scheme-Group-II-2018-A)
a) Inherited b) Lost
c) Flourished d) Migrated

13) **A respiratory protein which is present in all aerobic organisms is:**
(Grw-18A, Fsd-15A, DGK-II-18)
(Bahawalpur Board-New Scheme-2014-A)
a) Hemoglobin b) Myoglobin
c) Cytochrome a **d) Cytochrome c**

14) **Among the Scientists who believed in devine creation was ---------- .** **(DGK-I-14, DGK-I-18)**
(Bahawalpur Board-New Scheme-2015-A)
a) Charles Darwin **b) Carlous Linnaeus**
c) Alfred Wallace d) Jean Lamarck

15) **The oldest known fossils are of:**
(Bahawalpur Board-New Scheme-2017-A)
a) Fungi b) Eukaryotes
c) Prokaryotes d) Plants

16) **Book "The Origin of Species" was written by:**
(Sgd-19, Sah-14)
(Bahawalpur Board-New Scheme-2018-A)
a) Linnaeus **b) Darwin**
c) Lamarck d) Wallace

17) **Essay on the Principle of Population was published by:** **(Rwp-15A, Sgd-18A, DGK-II-19)**
(Faisalabad Board-Old Scheme-2014-A)
a) Sutton b) Darwin
c) Lyell **d) Malthus**

18) **A group of bacteria that can tolerate temperature up to 120 ^{0}C:**
(Faisalabad Board-New Scheme-2014-A)
a) Eubacteria b) *Mycoplasma*
c) Archaeobacteria d) *E.coli*

19) **Flagella may have arisen through the ingestion of prokaryotes similar to spiral shaped bacteria called:** **(Faisalabad Board-New Scheme-2016-A)**
a) *E.coli* b) Streptococcus
c) Spirochete d) *Rhizobium*

20) **In terrestrial vertebrates, gill pouches develop into:**
(Rawalpindi Board –New Pattern-2014-A)
a) Gills b) Lungs
c) Nose **d) Eustachian tube**

21) **Alfred Wallace developed a theory of natural selection essentially identical to:**
(Rawalpindi Board –New Pattern-2016-A)
a) Linnaeus's **b) Darwin's**
c) Lamark's d) Mendel's

22) **Endosymbiont hypothesis was proposed by:**
(Bwp-19A, Mtn-19A)
(Rawalpindi Board-New Scheme-Group-I-2017-A)
a) Cuvier b) Lyell
c) Lynn Margulis d) Malthus

23) **The gene pool consists of all genes at all gene loci in all individuals of:**
(Rawalpindi Board-New Scheme-Group-II-2017-A)
a) Individual b) Species
c) Population d) Community

24) **Which of the following is vestigial organ of a whale?** **(Sargodha Board-New Scheme-2016-A)**
a) Pelvis b) Leg bones
c) Lungs **d) Pelvis and leg bones**

25) **A group of interbreeding individuals belonging to a particular species and sharing a common geographic area is called:**
(D.G.K Board-New Scheme-Group II-2014-A)
a) Community **b) Population**
c) Ecosystem d) Biosphere

26) **In human, eustachian tubes connect middle ear with:**
(D.G.K. Board-New Scheme-Group-II-2015-A)
a) Nose b) Eye
c) Throat d) Brain

27) **The ultimate source of changes is:**
(D.G.K. Board-New Scheme-Group-I-2016-A)
a) Evolution **b) Mutation**
c) Genetic drift d) Migration.

28) **Biogeography is the geographical distribution of:**
(D.G.K. Board-New Scheme-Group-II-2016-A)
a) Phylum **b) Species**
c) Classes d) Genera

29) **An example of natural selection in action is evolution of antibiotic resistance in:**
(D.G.K. Board-New Scheme-Group-I-2017-A)
a) Algae b) Fungi
c) Bacteria d) Viruses

30) **Among birds, Darwin collected 13 types of:**
(D.G.K. Board-New Scheme-Group-II-2017-A)
a) Robins **b) Finches**
c) Ferrets d) Pterodactyles

31) **The first eukaryotes appeared about ---------- years ago.** **(Azad Jammu Kashmir Board-2017-A)**
a) 1.00 billion **b) 1.5 billion**
c) 2.00 billion d) 2.5 billion

III) From Entry Test:-

1) **---------- organs are functionally different but structurally alike.** **(Entry Test-2007)**
a) Analogous **c) Homologous**
b) Unilogous d) Hypologous

2) **The comperative embryologyof all vertebrates development of:** **(Entry Test-2012)**
a) Mars c) Stales
b) Gill pouches d) Fins

3) **The branch of biology that provides evidence through fossil record is called:**
(Self-Test Questions-2013)
a) Vestigial strucutres c) Biogeography
b) Comparative anatomy **d) Palaentology**

4) **One of the factors given below does not effect gene frequency:** **(Self-Test Questions-2013)**
a) Mutation c) Genetic drift
b) Migration **d) Food**

5) **Charles Darwin gave the:**
(Self-Test Questions-2013)
a) Theory of Special creation
b) Theory of Natural selection
c) Inheritance of Acquired characters
d) Cell theory

6) The structures which are reduced during the course of evolution and have no apparent function are called: (Entry Test-2013)

a) Regenerated organs c) Saltatory organs
b) Vestigial organs d) Useless organs

7) Which one of the following is considered as strong evidence of evolution? (Entry Test-2016)

a) Embryology Record c) Biochemical record
b) Molecular Record **d) Fossil Record**

8) Structures found in different species which are believed to have a common evolutionary origin are called: (Entry Test-2016)

a) Homlogous c) Vestigial
b) Analogous d) Fossilized

9) Process by which unrelated species evolve to functionally resemble each other is called: (Entry Test-2017)

a) Convergent evolution
b) Divergent evolution
c) Co-evolution
d) Parallel evolution

10) W.O.F shows evidence from evolution through molecular biology: (Entry Test-2017)

a) Development of bronchial arches in vertebrate embryo
b) Distribution of species
c) Comparisons of genes and proteins in different species
d) Study of vestigial organs

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. What are Hydrothermal Vents?

Sol. Hydrothermal Vents: -

1 Hydrothermal Vents are hot springs in the sea floor along the ocean ridges. At hydrothermal vents seawater percolates through cracks and is heated to 120 ^{0}C.

2. A hypothesis called vent hypothesis speculates that life oringinated in these hydrothermal vents. These vents could have supplied the energy and raw materials for the origin and survival of early life forms. Presence of archeobacteria (that tolerate the temperature upto 120 ^{0}C) supports this vent hypothesis.

2. State Endosymbion Hypothesis.

Sol. Endosymbiont Hypothesis: -

1. Endosymbiont hypothesis states that eukaryotic cells and their organelles might have evolved from endosymbiotic relationships between different species of prokaryotes.
2. It provides possible explanation of the evolution of eukaryotic organelles by phagocytosis of prokaryotes.
3. This hypothesis was proposed by Lynn Margulis.
4. According to this hypothesis:

a. Aerobic bacteria developed into mitochondria, when large anaerobic amoeboid prokaryotes ingested them and stabilized them instead of digesting them.
b. Ingestion of prokaryotes that resembled present-day cyanobacteria could have led to the endosymbiont development of chloroplasts in plants.
c. Flagella arose by symbiosis. First spiral shaped bacteria called spirochtes could have attached themselves to a host cell and became the flagella.

3. Define population genetics.

Sol. Population Genetics: -

1. Population genetics is the study of genetic events in a gene pool.
2. It emphasizes the extensive genetic variation within populations and recognizes the importance of quantitative characters.

4. How does fossil record provide evidence of evolution?

Sol. Fossil Record Providing Evidence of Evolution: -

1. Succession of fossil forms is a strong evidence in favour of evolution. It provides a visual record in a complete series showing the evolution of an organism.
2. Fossil record demonstrates that life has evolved through time.
3. Fossil record allows scientists to deduce the chronological appearance of the different classes of vertebrate animals from fishes to amphibians to reptiles to mammals and birds. This sequence is consistent with the history of vertebrate descent.
4. Sometimes fossil record is complete enough to allow us to trace the history of an organism. For example, the extensive fossil record for horses provides a detailed view of diversification of this group, from small forest dwellers to large and fast modern grassland species.

5. Explain the term homology with a suitable example.

Sol. A) Homology: -

1. Similarity in characteristics resulting from common ancestry is known as homology.
2. This similarity in organs of different species results from their deviation from a common ancestor.
3. The anatomical signs of evolution that exhibit such similarity are called homologous organs.
4. Homology describes structures that have common evolutionary origin.
4. Homology supports theory of organic evolution.

B) Example: -

Consider the limb bones of mammals. A human arm, a cat forelimb, a whale front flipper, and a bat wing, although quite different in appearance, have strikingly similar arrangement of bones, muscles, and nerves.

6. What are vestigial organs? Give two examples.

Sol. A) Vestigial Organs: -

Vestigial organs are historical remnants of structures that had important functions in ancestors but are no longer essential presently.

B) Two Examples: -

1. The whale retains pelvic and leg bones as useless vestiges.
2. Vermiform appendix in carnivores is another example of vestigial organ.

7. How are evolutionary relationships reflected in DNA and proteins?

Sol. Evolutionary Relationships Reflected in DNA and Proteins: -

Evolutionary relationships among species are reflected in their DNA (genes) and proteins (gene products).

a. If two species have genes and proteins with sequences of monomers that match closely, the sequence must have been copied from a common ancestor. For example, a common genetic code brings evidence that all life is related.

b. Similarly, taxonomically remote organisms, such as humans and bacteria, have some common proteins in common. For instance, cytochrome c, a respiratory protein is found in all aerobic species whether bacteria or humans.

II) From Punjab Boards:-

1. State theory of special creation.
(Sgd-19A, Rwp-16A, Fsd-14A, 18A, Lhr-I-17A, Grw-14A, Mtn-14A)
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Theory of Special Creation: -

A. According to Theory of Special Creation:

a. All living things came into existence in their present forms especially and specifically created by Nature.

b. Each species is fixed and immutable, thus never changed into different kinds or other species.

B. Among the scientists who believed divine creation was Carolus Linnaeus.

2. What is modern synthesis?
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Modern Synthesis: -

a. Darwin theory reappraised in terms of modern genetics (population genetics) is called Modern Synthesis.

b. An important turning point for evolutionary history was the birth of population genetics which emphasizes the extensive genetic variations within populations and recognizes the importance of quantitive characters. Darwin theory has been greatly expanded as result of our increasing knowledge of population genetics and a comprehensive theory of evolution called Modern Synthesis has been developed in the early 1940's.

c. It is called a synthesis because it integrated discoveries and ideas from many different fields, including paleontology, taxonomy, biogeography, and of course population genetics.

d. It is also called Neo-Drwinism.

3. Describe membrane invagination hypothesis of eukaryotic cell division. (Lhr-I-19A, II-19A)
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Membrane Invagination Hypothesis: -

Membrane Invagination Hypothesis proposes that prokaryotic cell membrane invaginates to enclose copies of its genetic material leading to the formation of several double –membrane-bound enities (organelles) in a single cell that then evolve into the eukaryotic mitochondrion, nucleus, chloroplast etc.

4. What are vestigial organs? Name some important vestigial organs of man.
(Lhr-I-16A, 18, Mtn-II-18A, Sah-15-18A, Ajk-17A, DGK-I, II-17A)
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. A) Vestigial Organs: -

They are remnants of more developed structures that were present and functional in ancestral organisms.

B) Names of Vestigial Organs of Man: -

a. A vermiform appendix
b. Ear muscles
c. Nictitating membrane
d. Coccyx

5. How artificial selection is different from natural selection? (Grw-15A, 17A, DGK-II-17, II-19A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Artificial Selection Different from Natural Selection: -

Natural Selection	Artificial Selection
1. Natural selection is a process in which population changes over time and the frequency of favorable traits increases in successive generations whereas less favourable traits become scarce or disappear.	1. Artificial selection means intential breeding between individuals for certain traits, or combination of triats.
2. In natural selection, nature determines which members of a population reproduce to a greater degree than other members.	2. In artificial selection, a breeder selects the animals and plants to reproduce.
3. The result of the natural selection is not predesired.	3. The result of artificial selection is predesired.
4. In natural selection, the environment selects or rejects variations.	4. In artificial selection, humans favour specific variations for selection
5. Natural selection is capable of considerable modifications of species in hundreds of million years.	5. Artificial selection produces so many changes in a species in relatively short period of time.

6. Define Neo Darwinism. (LHr-II-18A, Sah-16A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Neo-Darwinism: -

a. Darwin theory or Darwinism reappraised in terms of modern genetics (population genetics) is called Neo-Darwinism.

b. An important turning point for evolutionary history was the birth of population genetics, which emphasizes the extensive genetic variations within populations and recognizes the importance of quantitive characters. With progress in population genetics Darwinism was reconciled on the basis of genetic varaiation and natural selection and theory of Neo-Darwanism was developed in the early 1940's.

c. Neo-Darwinism is also called Modern Synthesis.

7. What is genetic drift?
(Rwp-19A, Mtn-16A, Fsd-15A, Sgd-19A, Bwp-17A, DGK-II-18A, II-16A, Sah-19A)
(Lahore Board-New Scheme-Group-II-2016-A)

Sol. Genetic Drift: -

a. Genetic drift is the change in frequency of alleles at a locus that occurs by chance.
b. In small populations, such fluctuations may lead to the loss of particular alleles.
c. Genetic drift occurs in a small population when a few individuals fail to reproduce and then genes are lost from the population.

8. What do you mean by non-random mating?
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Non-Random Mating: -

a. Non-random mating is mating among specific group of individuals in a large population.
b. In random mating, individuals with certain genotypes mate with one another more commonly than would be expected on a random basis.
c. It can cause an increase in homozygous Genotypes.

9. What are hydrothermal vents?
(DGK-I, II-18A, Mtn-14, 15, I-II-17)
(Gujranwala Board-New Scheme-2015-A)

Sol. Hydrothermal Vents: -

1 Hydrothermal Vents are hot springs in the sea floor along the ocean ridges. At hydrothermal vents seawater percolates through cracks and is heated to 120 ^{0}C.
2. A hypothesis called vent hypothesis speculates that life oringinated in these hydrothermal vents. These vents could have supplied the energy and raw materials for the origin and survival of early life forms. Presnce of archeobacteria (that tolerate the temperature upto 120 ^{0}C) supports this vent hypothesis.

10. What is endosymbiont hypothesis? Give example.
(Gujranwala Board-New Scheme-2018-A)(Mtn-I-II-18A)

Sol. Endosymbiont Hypothesis With Example: -

1. Endosymbiont hypothesis states that evkaryotic cells and their organelles might have evolved from endosymbiotic relationships between different species of prokaryotes.
2. It provides possible explanation of the evolution of eukaryotic organelles by phagocytosis of prokaryotes.
3. This hypothesis was proposed by Lynn Margulis.
4. According to this hypothesis:

a. Aerobic bacteria developed into mitochondria, when large anaerobic amoeboid prokaryotes ingested them and stabilized them instead of digesting them.
b. Ingestion of prokaryotes that resembled present-day cyanobacteria could have led to the endosymbiont development of chloroplasts in plants.
c. Flagella arose by symbiosis. First spiral shaped bacteria called spirochtes could have attached themselves to a host cell and became the flagella.

11. Name any four factors affecting gene frequency.
(Gujranwala Board-New Scheme-2018-A)
(Bwp-14A, Sah-14A)

Sol. Names of Any Four Factors Affecting Gene Frequency: -

a. Mutation
b. Migration
c. Genetic drift
d. Non-random mating

12. Define the term Homology. Give example.
(DGK-II-19A, Bwp-16A)
(Multan Board-New Scheme-Group-II-2017-A)

Sol. Homology With Example: -

1. Similarity in characteristics resulting from common ancestry is known as homology.
2. This similarity in organs of different species results from their deviation from a common ancestor.
3. The anatomical signs of evolution that exhibit such similarity are called homologous organs.
4. Homology describes structures that have common evolutionary origin.
5. Homology supports theory of organic evolution.

Example: -

Consider the limb bones of mammals. A human arm, a cat forelimb, a whale front flipper, and a bat wing, although quite different in appearance, have strikingly similar arrangement of bones, muscles, and nerves.

13. What are fossils? Where they are found?
(Rwp-II-17A)(Bahawalpur Board-New Scheme-2015-A)

Sol. A) Fossils: -

a. Fossils are either the actual remains, impressions or traces of the organisms of a formal geological age.
b. The organism may be embedded in sand, resin or ice.
c. Sometimes rock itself forms an impression around the organism, remains of the organsims or tissues being completely dissolved. This is called fossil mould.
d. Sometimes the fossil mould is filled by silica or calcium carbonate forming a fossil cast.

B) Where Most of the Fossils Found: -

Most of the fossils are found in sedimentary rocks.

14. Define Convergent Evolution? Give example.
(Bahawalpur Board-New Scheme-2017-A)

Sol. A) Convergent Evolution: -

The independent evolution of similar structures in distantly related organisms is known as convergent evolution.

B) Example: -

Wings of bat, birds and insects are examples of convergent evolution.

15. Give the importance of population genetics in evolution. (Faisalabad Board-New Scheme-2017-A)

Sol. Importance of Population Genetics in Evolution: -

It emphasizes the extensive genetic variation within populations and recognizes the importance of quantitative characters.

16. What are the contribution of Cuvier in evolution?
(Sargodha Board-New Scheme-2017-A)

Sol. Contribution of Cuvier in Evolution: -

a. He contributed much to the science of Palaentology.
b. He explained Earth's history by catastrophism.

17. Differentiate between homology and analogy.
(D.G.K. Board-New Scheme-Group-I-2014-A)(Sah-15A)

Sol. Differences Between Homology and Analogy: -

Homology	Ananlogy
1. Similarity in different species that result from their deviation from a common ancestor is called homology.	1. Similarity in different species that result from independent development of unrelated organisms is called analogy.
2. It describes structures that are different in functions but have common evolutionary origin.	2. It describes structures that are similar in functions but are different in evolutionary origin.
3. Homology is the result of divergent evolution.	3. Analogy is the result of convergent evolution.

18. Give the steps involved in membrane invagination hypothesis.
(D.G.K. Board-New Scheme-Group-I-2015-A)

Sol. Steps Involved in Membrane Invagination Hypothesis: -

a. A prokaryotic cell duplicates its genetic material (genome).
b. The plasma membrane invaginates to form double membrane-bound organelles.
c. The individual genomes separate from each other.
d. The nuclear genome eventually enlarges while other organelle genomes lose many of their genes, resulting in a eukaryotic cell.

19. What is the role of migration in affecting gene frequency?
(D.G.K Board-New Scheme-Group-I-2015-A)

Sol. Role of Migration in Affecting Gene Frequency: -

a. Migration leads to change the gene pool of various populations.
b. Because of each population is isolated to some extent from other populations, they have distinct genetic traits and gene pools. But both types of migration, that is, emigration and immigration, cause disturbance in the gene pool of the population due to corresponding movement of alleles or gene flow.
c. Migration enhances the spread of the advantageous alleles throught species.

20. Differentiate between homologous organs and analogous organs.
(Sahiwal Board-New Scheme-2017-A)

Sol. Differences Between Homologous Organs and Analogous Organs: -

Homologous Organs	Analogous Organs
1. They are functionally different but structurally alike.	1. They are functionally alike but structurally different.
2. They have a common evolutionary origin.	2. They are different in evolutionary origin.
3. They are the examples of divergent evolution.	3. They are the examples of convergent evolution.
4. Limbs of man, bat horse and whale are homologous organs.	4. Wings of bat, birds and insects are analogous organs.

21. Define Lamarkism and Theory of Special Creation.
(Sahiwal Board-New Scheme-2017-A)

Sol. A) Lamarkism: -
According to Lamarkism, the modifications an organism acquires during its life time can be passed along to its offspring e.g. the long neck of giraffe.

B) Theory of Special Creation: -
According to theory of special creation, all living things came into existence in their present forms especially and specifically created by Nature.

22. What is natural selection?
(Sahiwal Board-New Scheme-2018-A)

Sol. Natural Selection: -

a. Natural selection is a process in which population changes over time and the frequency of favorable traits increases in successive generations whereas less favourable traits become scarce or disappear.
b. In natural selection, nature determines which members of a population reproduce to a greater degree than other members.
c. The result of the natural selection is not predesired.
d. In natural selection, the environment selects or rejects variations.
e. Natural selection is capable of considerable modifications of species in hundreds of million years.

SECTION III

LONG QUESTIONS

1. Describe the evidences of evolution from comparative anatomy. (4)
(Lhr-II-18A, Mtn-16A, II-18A, Bwp-18A, Fsd-18A, DGK-I,II-16A)
(Lahore Board-Session-2012-2014-Group-I-2014-A)
2. Describe the inheritance of acquired characteristics. (4)
(Lahore Board-New Scheme-Group-II-2015-A)
3. Explain endosymbiont hypothesis for the origin of eukaryotic cell. (4)
(Lahore Board-New Scheme-Group-I-2016-A)
4. Explain evolution from prokaryotes to eukaryotes. (4)
(Lhr-II-14A, Ajk-17A)
(Lahore Board-New Scheme-Group-II-2016-A)
5. Discuss factors affecting gene frequency of population. (4)
(Mtn-II-17A, Bwp-15A, Sah-15A)
(Lahore Board-New Scheme-Group-I-2017-A)
6. Explain Darwin theory of natural selection. (4)
(Fsd-14, Lhr-I-15A, DGK-II-19A, Grw-15A)
(Gujranwala Board-New Scheme-2014-A)
8. Describe comparative embryology and fossil record as an evidence of evolution. (4)
(Lhr-I-19A, Lhr-II-19A, Mtn-15A, DGK-I-14A)
(Gujranwala Board-New Scheme-2018-A)

10. Explain Endosymbiont Hypothesis for origin of Eukaryotic Cells. (4)
(Bahawalpur Board-New Scheme-2016-A)
11. What two points are given by Darwin in his book "The Origin of Species". (4)
(Faisalabad Board (Old Scheme) (2014-A)
12. Write notes on: (2+2)
a) Natural Selection
b) Artificial Selection
(Faisalabad Board-New Scheme-2017-A)
13. Write a short note on Neo-Darwinism. (4)
(Rawalpindi Board-New Pattern-2014-A)(DGK-II-19)
14. Write the main points of theory of natural selection.(4)
(Rawalpindi Board-New Pattern-2016-A)
15. Write a detailed note on comperative anatomy as an evidence of evolution. (4)
(Rawalpindi Board-New Scheme-Group-I-2017-A)
16. Write an essay on Lamarkism. (4)
(Rawalpindi Board-New Scheme-Group-II-2017-A)(SGD-17A)
17. Describe non-random mating and selection as factors affecting gene frequency. (4)
(Rawalpindi Board-New Pattern-2018-A)
18. Explain membrane invagination theory for the evolution of eukaryotic cells. (4)
(D.G.K. Board-New Course-Group-I-2015-A)

C h a p t e r ---- 25

ECOSYSTEM

1 MCQ

I) From Exercise:-

1) The study of relationships of organisms to their environment is known as: (Ajk-17A)
a) Biology **b) Ecology**
c) Zoology d) Morphology

2) Similar group of individuals who can interbreed and produce organisms of their own kind forms a:
a) Population b) Community
c) Species d) Succession

3) When living and non-living components interact to produce a stable system in which exchange of material with flow of energy takes place, it forms a/an:
a) Environment **b) Ecosystem**
c) Stable Community d) Ecological Succession

4) Living organisms can prepare their own food are:
a) Predators b) Parasites
c) Producers d) Prey

5) The living organisms which cannot prepare their own food but obtain ready-made from others, are:
a) Primary and Secondary Consumers
b) Secondary and Tertiary Consumers
c) Only Primary Consumers
d) Consumers

II) From Punjab Boards:-

1) In 1917 Joseph Grinnell an American Ornithologist first proposed the term: (Sah-18, Grw-14)
(Lahore Board-Old Scheme-Group-II-2014-A)
a) Ecology b) Habitat
c) Biome **d) Niche**

2) Biome is a:
(Lahore Board-New Scheme-Group-I-2014-A)
a) Simple community
b) Complex community
c) Regional community
d) Climax community

3) Who proposed the term Niche in Ecology:
(Lahore Board-New Scheme-Group-II-2014-A)(Rwp-I-17)
a) Haeckel **b) Grinelle**
c) Eton d) Darwin

4) One of the following is an example of predator-prey relationship:
(Lahore Board-New Scheme-Group-I-2015-A)
a) Fungus and algae b) Flower aand insect
c) Fox and rabbit **d) Root nodule and bacteria**

5) The bacteria in the root nodules fix nitrogen and convert it into:
(Lahore Board-New Scheme-Group-II-2015-A)
a) Nitrate b) Nitrite
c) Amino acid d) Ammonia

6) The term niche was first proposed by Joseph Grinnell an American:
(Lahore Board-New Scheme-Group-II-2018)
a) Embryologist b) Ecologist
c) Ornithologist d) Physiologist

7) Study of relationship of different communities to environment is called: (Fsd-18A)
(Gujranwala Board-New Scheme-2016-A)
a) Synecology b) Autecology
c) Embryology d) Zoology

8) All the food chains and food webs begin with: (Bwp-18, DGK-II-14, II-19, Sah-15)
(Gujranwala Board-New Scheme-2017-A)
a) Producers b) Primary consumers
c) Secondary consumers d) Decomposers

9) The relationship of shark with small fish remoras is an example of:
(Multan Board-Old Scheme-2014-A)(Mtn-II-17)
a) Grazing **b) Commensalism**
c) Parasitism d) Predation

10) Soil erosion, fire and percolation down through the soil cause loss of:
(Multan Board-New Scheme-2014-A)
a) Sulphates b) Carbonates
c) Nitrates d) Phosphates

11) A localized group of species belonging to the same species is called as:
(Multan Board-New Scheme-2015-A)
a) Community **b) Population**
c) Ecosystem d) Biosphere

12) Lichen is a symbiotic association between a fungus and: (Fsd-17)
(Multan Board-New Scheme-Group-II-2018-A)
a) Gymnosperm b) Angiosperm
c) An alga d) Pteridophyta

13) Disease in living organisms which are caused by parasites are termed as: (Fsd-14A, 15, Grw-19A)
(Bahawalpur Board-New Scheme-2014-A)
a) Infections **b) Infestations**
c) Parasitism d) Succession

14) Lithosphere includes:
(Bahawalpur Board-New Scheme-2015-A)
a) Earth Soil b) Air
c) Water d) Gases

15) The whole of the world's land is called:
(Faisalabad Board-Old Scheme-2014-A)
a) Ecosphere b) Hygrosphere
c) Lithosphere d) Biosphere

16) When bacteria in soil oxidize ammonia or ammonium ions, this is called: (Bwp-17, DGK-II-15)
(Faisalabad Board-New Scheme-2016-A)
a) Oxidation b) Dentrification
c) Ammonification d) Nitrification

17) Study of single population's relationship to environment is called:
(Rawalpindi Board-New Pattern-2015-A)
a) Autecology b) Synecology
c) Ecology d) Gerantology

18) The animal that caught and eaten is called:
(Rawalpindi Board-New Pattern-2016-A)
a) Predator **b) Prey**
c) Host d) Parasite

19) Biome is a large:
(Rawalpindi Board-New Pattern-2018-A)
a) Simple community b) Complex community
c) Regional community **d) Climax community**

20) If population of predator increases then population of prey: (Sargodha Board-New Scheme-2016-A)
a) Increases **b) Decreases**
c) May increase or decrease d) Has no effect

21) All the populations within an ecosystem are known as: (Sargodha Board-New Scheme-2017-A)(DGK-II-17)
a) Community b) Species
c) Food web d) Pioneers

22) Symbiotic relationship between insects and flowering plants is the example of:
(DGK-II-15, I-16, I-19)
(Sargodha Board-New Scheme-2018-A)
a) Parasitism b) Predation
c) Commensalism **d) Mutualism**

23) C. Etton defined the Niche as the species:
(D.G.K. Board-New Scheme-Group-II-2016-A)
a) Behavier b) Address
c) Role d) Habitat

24) Biosphere is spread out over the surface of planet earth extending about:
(D.G.K. Board-New Scheme-Group-I-2017-A)
a) 3-6 kilometers b) 4-8 kilometers
c) 8-10 kilometers d) 8-12 kilometers

25) Several bacteria in the soil are able to oxidize ammonia or ammonium ions, this oxidation is known as:
(D.G.K. Board-New Scheme-Group-I-2018-A)
a) Ammonification **b) Nitrification**
c) Oxidation d) Denitrification

26) In ecosystem, second trophic level is consisted of:
(D.G.K. Board-New Scheme-Group-II-2018-A)
a) Producer **b) Primary consumer**
c) Secondary consumer d) Tertiary consumer

27) The abiotic component of an ecosystem is:
(Sahiwal Board-New Scheme-2015-A)
a) Temperature b) Producer
c) Consumer d) Decomposer

28) A treasure of all types of resources essential to maintain life on earth is:
(Sahiwal Baord-New Scheme-2016-A)
a) Environment b) Water
c) Land **d) Sun**

III) From Entry Test:-

1) Pick the biotic component from the following.
(Entry Test-2007)
a) Soil b) Atmosphere
c) Water **d) Animals**

2) What is the niche of an organism in an ecosystem?
(Entry Test-2012)
a) Role played by many organisms in an ecosystem
b) Role played by dead organism in an ecosystem
c) Role played by community of microorganisms in their ecosystem
d) Role played by an organism in its ecosystem

3) The distinct levels or links of food chain are called:
(Entry Test-2012)
a) Trophic level c) Energy pyramid
b) Food web d) Food chain

4) Bacteria and fungi are examples of:
(Entry Test-2012)
a) Predators c) Consumers
b) Decomposers d) Derivers

5) A relationship between two or more organisms of different species in which all partners get benefit is called: (Entry Test-2012-2013)
a) Symbiosis c) Commensalism
b) Parasitism d) Predation

6) Populations of different species (plants and animals) living in the same habitat form a:
(Entry Test-2012)
a) Community c) Biosphere
b) Ecosystem d) Microhabitat

7) A group of inter-breeding individuals occurring together in a space and time is called:
(Self-Test Questions-2013)
a) Community c) Niche
b) Population d) Species

8) Which of these is biotic factor of the ecosystem?
(Self-Test Questions-2013)
a) Air c) Soil
b) Water **d) Photosynthetic plants**

10) A thin layer of earth in which all living organisms exists is called: (Self-Test Questions-2013)
a) Ecosystem c) Habitat
b) Biosphere d) Xerosere

11) In an ecosystem mycorrhizaw are an example of: (Entry Test-2013)
a) Predation c) Mutualism
b) Symbiosis d) Parasitism

12) Living part of an ecosystem is: (Entry Test-2013)
a) Lithosphere c) Community
b) Hydrosphere **d) Biosphere**

13) The living association between two living organisms of different species which is beneficial to both the partners is called: (Entry Test-2013)
a) Commensalism **c) Mutualism**
b) Parasitism d) Predation

15) Which one of the following is the ultimate distributional unit within which a species is restrained by the limitations of physical structure and physiology? (Entry Test-2014)
a) Niche c) Biome
b) Ecosystem d) Habitat

16) All the herbivores belong to which trophic level in the food chain? (Entry Test-2014)
a) T_1 c) T_3
b) T_2 d) T_4

17) How many food chains are present in following food web?
a) 5 c) 3
b) 6 **d) 4**

18) The relationship in which one organism gets benift and the other is not affected is called: (Entry Test-2014)
a) Mutualism c) Predation
b) Commensalism d) Parasitism

19) During successions, the first organisms that develop on bare rock are: (Entry Test-2015)
a) Lichens c) Moss
b) Shrubs d) Herbs

20) Trophic level of herbivore in given food web is:
a) 1 c) 4
b) 3 **d) 2**

21) The organisms of third trophic level are: (Entry Test-2016)
a) Primary consumer c) Tertiary consumer
b) Primary producer **d) Secondary consumer**

22) The ultimate source of energy in an ecosystem is: (Entry Test-2016)
a) Photosynthesis c) Plants
b) Sun d) Water

23) All the food chain and food webs begin with: (Entry Test-2016)
a) Detritus **c) Green plants**
b) Herbivores d) Omnivores

25) How denitrification does occur in soils? (Entry Test-2017)
a) Bacterial reduction of NO_3^- ions to N_2 gas
b) Active uptake of Nitrate ions by plant roots
c) Drainage of manure from fields
d) Leaching of nitrate ions

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. What are biogeochemical cycles?

Sol. Biogeochemical Cycle: -

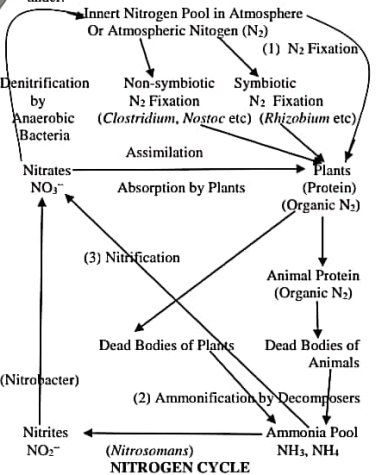
1. Biogeochmical cycle is the circulating pathway of an element through the biotic and abiotic components of an ecosystem.
2. Environment is a source of chemical elements essential for living organisms, some are required by organisms in large amounts while others are required in small amounts or in traces. These chemical elements are called biogenic elements or nutrient elements. These nutrients are used by the plants in their growth which inturn form food for the heterotrophic organisms. The dead bodies of plants and heterotrophic organisms are decomposed by microrganisms releasing these nutrients back into the environment. Thus the nutrients continuously move from environment to organisms and back to environment. This is called biogeochemical cycle.
3. Biogeochemical cycle is a term emphasizing that the cycle of chemical elements involves not only biological organisms and processes, but also geological (abiotic) systems and processes.
4. It is also called nutrient cycle.

2. Sketch three main steps in the nitrogen cycle.

Sol. Sketch of Three Main Steps in Nitrogen Cycle: -

Three main steps of nitrogen cycle are:
1. Nitrogen fixation
2. Ammonification
3. Nitrification

The sketch of three main steps in nitrogen cycle is as under:



NITROGEN CYCLE

5. What is autecology?

Sol. Autecology: -

1 The study of relationship of a single population to its environment is called autecology
2. It accounts for interrelationships between an individual species and its environment.
3. It might study a population of microorganisms, animals, or plants.
4. It is also called population ecology.

Examples: -

a. Study of 50 to 100 plants of soya bean only, in order to know the effect of water pollution on their growth and yield is autecology.
b. Study of single Mago tree in a garden is autecology in nature. The study of chemical pollution on the growth and the yield of 100 mango plants is also autecology.

6. Define synecology.

Sol. Synecology: -

1. The study of relationship of different communities or group of populations to their environment is called synecology.
2. It is also known as community ecology.
3. In synecology, community and its various aspects like the origin, structure and composition of community are studied.
4. While studying the community, we come across three levels of integration:

i. Individual
ii. Population
iii. Community

II) From Punjab Boards:-

1. Compare population with community.
(Rwp-19A, Sgd-19A, DGK-II-19A, DGK-I-16A, Sgd-14A, 18A, Rwp-I-17A, Bwp-15A, 16A, Mtn-II-18A, Grw-16A, Mtn-14A)
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Comparison of Population With Community: -

Population	Community
1. Population is a group of same kind of organisms living together in the same habitat at the same time. 2. It accounts inter-breeding individuals of same species. 3. Populations exhibit some distinctive characteristics such as population density, population pressure, growth rates, age distribution etc. **Examples: -** The frogs in a pond make up the frog population. Rohu (fish) in the same make up the Rohu population and the *Hydrilla* plants there make up the *Hydrilla* population.	1. Community is a group of many different kinds of organisms living together in the same habitat at the same time. 2. It accounts different species of organisms forming different populations. 3. Communities exhibit some characteristic properties that populations lack, such as number and types of species present, relative abundance of each species, the interactions among different species etc. **Example: -** A fresh water pond includes the population of *Hydrilla*, a population of frogs, insects, worms, Rohu and many other kinds of animals. Populations of all these organisms, sharing same habitat, constitute the community of that pond.

2. Define biosphere. (Lhr-I-15A)
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Biosphere: -

a. Biosphere is the zone of air, land, and water at the surface of earth in which living organisms are found.
b. The biosphere consists of:
i. Earth surface or earth crust -- Few meters in depth
ii. Air capsule --- About 8-10 kilometers up into atmosphere
iii. Water ---- About eight to ten kms down in depths of oceans.
d. All living things live within biosphere and no life exists beyond it.
e. Organisms within the biosphere not only adapt themselves to the environment but also interact to modify and control chemical and physical conditions of the biosphere.

3. Differentiate between consumers and decomposers.
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. Differences Between Consumers and Decomposers:

Consumers	Decomposers
They are mainly the animals including man which directly or indirectly depends on the producers.	They are mainly the fungi and bacteria which obtain energy from dead and decaying plants and animals.

4. Differentiate between biomes and biosphere.
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. Differences Between Biomes and Biosphere: -

Biomes	Biosphere
1. Biomes are large, relatively distinct terrestrial regions of biosphere. 2. A biome is a large regional land ecosystem characterized in particular by certain climatic conditions and particular types of plants. **Examples: -** Grasslands, deserts, tropical rain forests, tundra etc.	1. Biosphere is the zone of air, land, and water at the surface of the earth in which living organisms are found. 2. The entire biosphere is an ecosystem, a place where organisms interact among themselves and with the physical and chemical environment. Example: - Earth

5. What are producers and consumers?
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. A) Producers: -

a. Producers are the green photosynthetic plants, which capture and bring light energy into the ecosystem.
b. They are able to manufacture organic food from simpler inorganic substances.
c. They are autotrophs.

B) Consumers: -

a. Consumers are all the organisms, primarily animals.
b. They obtain energy directly or indirectly from the producers as ready-made organic food.
c. They are mainly heterotrophic organisms.

6. Define food chain. (Lhr-II-15, I-16A)
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Food Chain: -

a. The transfer of food energy from the source in plants through the series of steps of eating and being eaten of the organisms is called food chain.
b. A food chain represents only one possible route of transfer of food material and energy
c. Food chain begins with a green plant (producer) and may consist of three to five links or trophic levels. Producers occupy the first trophic level, primary consumers (herbivores) occupy the second, secondary consumers (carnivores and omnivores) the third and so on.

Producer ⟶ Primary Consumer ⟶ Secondary Consumer ⟶ Tertiary Consumer ⟶ Decomposer

Examples: -

i. Grass ⟶ Cow ⟶ Man
ii. Grass ⟶ Mole ⟶ Fox ⟶ Bacteria
iii. Grass or Green Leaves ⟶ Caterpillar ⟶ Blue Bird ⟶ Eagle

7. Sketch three main steps in nitrogen cycle.
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. See Exercise Chapter No: 25 Answer No: 2

8. What is commensalism? Give one example.
(Ajk-17, DGK-I-15, II-19A, Sgd-17A, Sah-19A, Lhr-I-17A, Fsd-15A, 18A, Bwp-15A, SGD-14A, Grw-19A, Fsd-18A, DGK-I-18A, Rwp-16A, Sah-17A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Commensalism With One Example: -

A) Commensalism: -
Commensalism is the symbiotic association of two organisms of different species in which one member (commensal) is benefited, and the other (host) is neither harmed nor helped by the association.

B) One Example: -
Remora is a small fish which attaches itself, with the help of its sucker, just behind the mouth opening of the shark. It takes a free ride and swallow the falling out pieces of food as the shark eats its prey. The shark does not benefit from this relationship nor its skin harmed by the sucker of remora.

9. Define autecology with the help of an example.
(Lahore Board-New Scheme-Group-II-2016-A)(Mtn-17A)

Sol. Autecology With an Example: -

1 The study of relationship of a single population to its environment is called autecology
2. It accounts for interrelationships between an individual species and its environment.
3. It might study a population of microorganisms, animals, or plants.
4. It is also called population ecology.

Examples:

a. Study of 50 to 100 plants of soya bean only, in order to know the effect of water pollution on their growth and yield is autecology.
b. Study of single Mago tree in a garden is autecology in nature. The study of chemical pollution on the growth and the yield of 100 mango plants is also autecology.

10. Write down the significance of root nodules in plants.
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Significance of Root Nodules In Plants: -
The bacteria within root nodules in plants serve to fix atmospheric nitrogen into amino acids. These amino acids are used by the host plants in making the proteins and other compounds.

11. Define biosphere and ecosystem. (Grw-16A)
(Lahore Board-New Scheme-Group-I-2018-A)

Sol. A) Biosphere: -
Biosphere is the zone of air, land, and water at the surface of earth in which living organisms are found.

B) Ecosystem: -
Ecosystem is defined as the community interacting with its environment through a one-way flow of energy
and the cycling of material.

12. Define synecology.
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. Synecology: -

1. The study of relationship of different communities or group of populations to their environment is called synecology.
2. It is also known as community ecology.
3. In synecology, community and its various aspects like the origin, structure and composition of community are studied.
4. While studying the community, we come across three levels of integration:

i. Individual
ii. Population
iii. Community

13. What are Lichens? (Grw-15A, Mtn-I-18A, Sgd-16A)
(Lahore Board-New Scheme-Group-II-2018-A)

Sol. Lichens: -

a. Lichens are dual organsims composed of symbiotic association of a green alga or a cyanobacteria living within a fungus mycelium.
b. Lichens grow at such places where neither of the partner alone can. They are important colonizers of bare rocks.
c. Lichens are an example of mutualism between a fungus and alga. Fungus protects the algal partner from strong light and desiccation and itself gets food through courtesy of alga.

Example:

Crustose lichens are special types of lichens that get impergenated in the form of crust on bare rocks that do not possess miosure and organic matter. One example of crustose lichens is *Rhiza.*

14. Define food chain and food web.
(Lhr-19A, Fsd-14A, Rwp-15A, Sgd-16A, Grw-18A, Mtn-14A)
(Gujranwala Board-New Scheme-2014-A)

Sol. Food Chain and Food Web: -

A) Food Chain: -

a. The transfer of food energy from the source in plants through the series of steps of eating and being eaten of the organisms is called food chain.
b. A food chain represents only one possible route of transfer of food material and energy
c. Food chain begins with a green plant (producer) and may consist of three to five links or trophic levels. Producers occupy the first trophic level, primary consumers (herbivores) occupy the second, secondary consumers (carnivores and omnivores) the third and so on.

Producer ⟶ Primary Consumer ⟶ Secondary Consumer ⟶ Tertiary Consumer ⟶ Decomposer

Examples: -

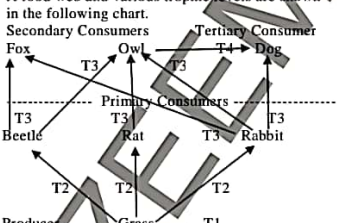
i. Grass ⟶ Cow ⟶ Man
ii. Grass ⟶ Mole ⟶ Fox ⟶ Bacteria
iii. Grass or Green Leaves ⟶ Caterpillar ⟶ Blue Bird ⟶ Eagle

B) Food Web: -

a. Food web is actually "the combination of many food chains".
b. Food web is not really simple and straight forward, because most animals eat more than one type of food at different times.
c. Like food chain, food web begins with a green plant (producer) and may consist of three to five links or trophic levels. However, more complex trophic levels or food links are found in a food web.
d. The variety of pathways in a food web helps to maintain the stability of the ecosystem.

Examples: -

A food web and various trophic levels are shown in the following chart.



15. How nitrogen depletion from soil is being overcome in nature? (Fsd-14A)
(Gujranwala Board-New Scheme-2014-A)

Sol. Overcoming of Nitrogen Depletion from Soil in Nature: -

a. Nitrogen fixing bacteria which incorporate gaseous nitrogen from air into organic compound.
b. Nitrogen fertilizers are added by the man.

16. What is symbiosis? Give one example.
(Gujranwala Board-New Scheme-2015-A)

Sol. A) Symbiosis: -

a. Symbiosis is a term used for interactions in which two organisms (symbionts) live together in close relationship that is beneficial to at least one of them.
b. Symbiotic interactions are of three kinds:
i. One species benefits and other is unaffected (neither harmed nor benifited) --- **commensalism**
ii. Both species in the relationship benefit from the association --- **mutualism**
iii. One species benefits and the other is harmed --- **parsitism**

B) One Example of Symbiosis: -

The legume plants are the hosts to symbiont bacteria, which inhabit the roots forming root nodules. The bacteria in the roo nodules fix nitrogen in the soil from air, converting it into amino acid, which the host uses. In turn, host provides bacteria with food and protection.

17. What do you understand the trophic level?
(Gujranwala Board-New Scheme-2017-A)

Sol. Trophic Level: -

a. The trophic level of an organism is the position it occupies in a food chain.
b. The word trophic derives from the Greek (trophe) referring to food or nourishment.
c. The trophic levels can be represented by numbers, starting at level 1 with plants. Further trophic levels are numbered subsequently according to how the organism is along the food chain. There are following trophic levels:

i. **Level 1** ---- Plants and algae make their own food and are called producers.
ii. **Level 2** ----- Herbivores eat plants and are called primary consumers.
iii. **Level 3** ---- Carnivores that eat herbivores are called secondary consumers.
iv. **Level 4** ---- Carnivores that eat other carnivores are called tertiary consumers.

18. Eumerate the symbiotic associations.
(Gujranwala Board-New Scheme-2017-A)

Sol. Symbiotic Associations: -

a. Symbiosis means living together (sym: with; bio: life).
b. Symbiosis is the relationship between two or more organisms living closely together with some form of feeding relationship involved.
c. The three main symbiotic associations or relationships are:

i. **Mutualism** ---- Where both organisms benefit.
ii. **Commensalism** --- Where one organism benefits while the other organism is not harmed.
iii. **Parasitism** ---- Where one organism benefits and causes harm to other organism.

19. How biogeochemical cycles maintain the fertility of soil? (Gujranwala Board-New Scheme-2017-A) (DGK-II-15A)

Sol. Maintenance of the Fertility of Soil by Biogeochemicle Cycles: -

a. Biogeochemicle cycle is maintained by the activities of nitrogen fixing bacteria which incorporate gaseous nitrogen from air into organic – nitrogen containing compounds.

b. Soil nitrogen resources are also strengthened by the addition of nitrogen fertilizers by the man himself.

20. What are Biotic components of an ecosystem? (Multan Board-New Scheme-2016-A) (Mtn-II-18A, Rwp-18A)

Sol. Biotic Components of an Ecosystem: -

a. Living organisms that interact in an ecosystem make up its biotic components.

b. Biotic components include producers, all types of consumers and the decomposers.

21. What is Mycorrhiza? (Bwp-19A, Sgd-19A) (Multan Board-New Scheme-2016-A)

Sol. Mycorrhiza: -

a. Mycorrhiza is a mutualistic association between roots of a vascular plants (pine, beech or heather) growing in acid soil and certain fungi.

b. The plant provides the fungus with an enzyme to digest carbohydrates in leaf litter. The fungus, in turn, passes mineral ions from soil to plant.

22. Differentiate between Micronutrients and Macronutrients. (Fsd-15A)(Multan Board-New Scheme-2016-A)

Sol. Differences Between Micronutrients And Macronutrients: -

Micronutrients	Macronutrients
The nutrients required in small quantity are called micronutrients. **Examples: -** Zinc. Iodine, Iron	The nutrient elements which are required in large quantity are called macronutrients. Examples: - Carbon Hydrogen, Oxygen, Nitrogen

23. Differentiate between Predator and Prey. (Grw-19A) (Multan Board-New Scheme-Group-I-2017-A)

Sol. Differences Between Predator And Prey: -

Predator	Prey
1. A predator is an animal which kills and feeds on other animals. 2. A predator animal is a generally carnivorous type of animal. 3. Predator always adopts to maximize its capabilities to kill the prey.	1. A prey is that animal that is hunted or attacked by other animal. 2. Prey is usually a herbivorous animal. 3. Prey always adopts and tries to away from its predators via various means.

24. Compare Autecology with Synecology. (Sah-14, 15, Fsd-17A, Bwp-16, Bwp14A, 18, Mtn-II-18A, Ajk-17, Sah-19A, Lhr-I-19A) (Multan Board-New Scheme-Group-I-2018-A)

Sol. Comparison of Autecology With Synecology: -

Autecology	Synecology
1. It accounts for interrelationship between an individual species and its environment. 2. It is also known as population ecology. 3. In autecology, only one population at the same time is studied. 4. Study of 50 to 100 plants of soya bean only, in order to know the effect of water pollution on their growth and yield is autecology.	1. It is the study of different communities, their relationship between them and their environment. 2. It is also known as community ecology. 3. In synecology, all the populations (grouping of populations) are studied at the same time. 4. Study of various aspects of community like the origin, structure and composition of the community is synecology.

25. Define Parasitism and give atleast one example. (Bahawalpur Board-New Scheme-2014-A)

Sol. Parasitism: -

a. It is an association between different organisms of two different species, in which the smaller species (parasite) lives upon or within the other (host); the host is frequently harmed by this relationship but not often killed.

b. The dependence of parasite on its host is metabolic and involves mutual exchange of substances.

c. Sometimes parasites may be pathogenic causing diseases to their hosts.

d. The diseases in living organisms which are caused by parsites are called infestations.

e. Parasitism can be a powerful determinant of host survival & parasite.

f. Parasites may be actoparasites, living outside the body of host and are called ectoparasites while some parasites live inside the body of the host and are called endoparsites.

Examples: -

i. Fungi, lice, ticks mites are some examples of ectoparsites

ii. Tape worm in the intestine of man, *Plasmodium*, *Entamoeba histolytica* are some examples of endoparasites.

26. What is Ecological Niche? (Rwp-15A)
(Bahawalpur Board-New Scheme-2016-A)

Sol. Ecological Niche: -

a. A niche is defined as the role a species plays in a community including behavior and influence.
b. Niche is also defined as the ultimate distributional unit within which a species is restrained by the limitations of its physical structure and its physiology.
c. Within a particular habitat, organisms of different species have their own ways of life and food relationships with other organisms. Thus an organism or its population's role in a particular habitat, its activities, requirements, and its effects are collectively called ecological niche. In addition, niche includes all the physical factors of the environment necessary for survival, such as temperature range, amount of humidity, the pH of the water and soil and other factors.

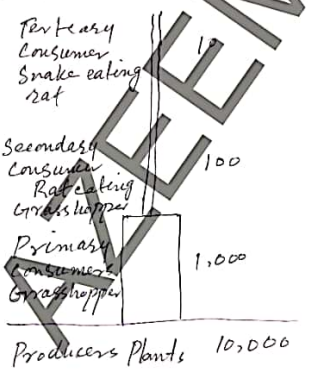
27. What is the function of Root Nodules?
(Bahawalpur Board-New Scheme-2017-A)

Sol. Function of Root Nodules: -

The bacteria within root nodules in plants serve to fix atmospheric nitrogen into amino acids. These amino acids are used by the host plants in making the proteins and other compounds.

28. Sketch food chain to show various trophic levels.
(Faisalabad Board-New Scheme-2016-A)(DGK-I-19A)

Sol. Sketch of Food Chain Showing Various Trophic Levels: -



29. Name three levels of integration in community.
(Faisalabad Board-New Scheme-2016-A)

Sol. Names of Three Levels of Integration in Community: -

a. Individual
b. Population
c. Community

30. Differentiate between predation and parasitism.
(Faisalabad Board-New Scheme-2016-A)(DGK-II-19A)

Sol. Differences Between Predation and Parasitism: -

Predation	Parsitism
1. It is not an intimate associton between predator and prey. 2. Predator just kills and eats the prey. **Example: -** Cat eats the mouse.	1. It is an intimate association between the parasite and the host. Parsite lives upon or inside the host. 2. Parasites harms the host but often does not kill the host. **Example: -** *Entamoeba histolytic* lives in the intestine of man and causes amoebic dysentery.

31. What is the difference a parasite and parasitism?
(Faisalabad Board-New Scheme-2017-A)

Sol. Differences Between a Parasite and Parasitism: -

Parasite	Parasitism
Parasite is the small species of organism in parasitism that harms the host.	It is an association between different organisms of two different species, in which the smaller species lives upon or within the other (host); the host is frequently harmed by this relationship but not often killed.

32. Differentiate between habitat and ecological niche.
(SGD-16, DGK-II, 14A, 16A, DGK-I-19A)
(Rawalpindi Board-New Pattern-2014-A)

Sol. Differences Between Habitat And Ecological Niche:

Habitat	Niche
1. The type of environment in which a particular organism or population lives is its habitat. 2. The habitat is organism's home address.	1. The role (including behavior and influence) which a particular organism or its population plays in a particular habitat is called Niche or Ecological Niche. 2. Niche refers to profession or job of an organism or population.

33. What is difference between Biotic and Abiotic components? Give examples of Abiotic components.
(Rawalpindi Board-New Pattern-2015-A)(DGk-II-18A)

Sol.

A) Differences Between Biotic and Abiotic components:

Biotic Components	Abiotic Components
1. Living organisms that interact in an ecosystem make up its biotic components. 2. Biotic components include producers, all types of consumers and the decomposers.	1. Abiotic components of an ecosystem are the physical aspects of its surrounding which influence the biotic components. 2. Abiotic components include all non-living components air, water, soil etc.

B) Examples of Abiotic Components: -

a. Light
b. Temperature
c. Water
d. Atmosphere and wind
e. Fire
f. Soil
g. Topography
h. Gravity
i. Inorganic nutrients

34. What do you know about the term Ecosystem.
(Rawalpindi Board-New Pattern-2016-A)
(Lhr-II-19A, Rwp-II-16A)

Sol. Ecosystem: -

a. Ecosystem is defined as the community interacting with its environment through a one-way flow of energy and the cycling of material.
b. Organisms interact with their environment within the confines of the ecosystem.
c. It is the major unit of ecology. The eco part of the word is related to the environment and the system part means collection of related parts that function as a unit. The ecosystem consists of two basic interacting components, the living or biotic, and the physical or abiotic factors.
d. Biotic components of ecosystem are animals, plants, fungi, microorganisms etc. and abiotic components are atmosphere, climate, soil, and water.

35. What is parasitism? Give its kind.
(Rawalpindi Board-New Scheme-Group-I-2017-A)

Sol. A) Parasitism: -

It is an association between different organisms of two different species, in which the smaller species (parasite) lives upon or within the other (host); the host is frequently harmed by this relationship but not often killed.

B) Kinds of Parasitism: -

a. Ectoparasitism: -

It is the association in which small species called ectoparasite lives outside the body of the host and horms it.

Examples: -

Fungi, lice, ticks mites are the organisms which form ectoparasitism with their host.

b. Endoparasitism: -

It is the association in which small species called endoparasite lives inside the body of the host and horms it.

Examples: -

Tape worm in the intestine of man is an endparasite which forms endoprasitism with its host.

36. List any four macronutrients.
(Rawalpindi Board-New Scheme-Group-II-2017-A)

Sol. List of Four Macronutrients: -

a. Water
b. Carbon
c. Hydrogen
d. Nitrogen
e. Phosphoreus
d. Sulfur

37. Differentiate between biosphere and niche.
(Rawalpindi Board-New Pattern-2018-A)

Sol. Differences Between Biosphere And Niche: -

Biosphere	Niche
1. Biosphere is the zone of air, land, and water at the surface of the earth in which living organisms are found. 2. The entire biosphere is an ecosystem, a place where organisms interact among themselves and with the physical and chemical environment.	1. The role (including behavior and influence) which a particular organism or its population plays in a particular habitat is called Niche or Ecological Niche. 2. Niche refers to profession or job of an organism or population.

38. What are Decomposers?
(Sargodha Board-New Scheme-2014-A)

Sol. Decomposers: -

a. Decomposers are the microbial heterotrophs that break down dead organic material of plants and animals into simpler substances by secreting digesting enzymes into their body and then absorb the products.
b. Decomposers utilize some of the decomposition products as a source of energy, while rest is released in environment as chemical ions (nitrates, ammonia, phosphates, potassium and calcium) that are made available for consumption of producers.
c. They are also called saprotrophs or saprobes.
d. They are mainly the fungi and animals.

39. Define ammonification.
(Sargodha Board-New Scheme-2016-A)

Sol. Ammonification: -

a. Ammonification is a process by which microbes break down nitrogen-containing organic material and release ammonia and ammonium ions.
b. Microbes which take part in ammonification are certain soil bacteria called ammonifying bacteria and fungi.
c. In ammonification, bacteria and fungi use the proteins, amino acids and nucleic acids and release excess of ammonia (NH_3) or ammonium ions (NH_4+) ions.
d. Ammonification is a part of nitrogen cycle.

40. Differentiate between Mutualism and Commensalism.
(Sargodha Board-New Scheme-2018-A)

Sol.

Mutualism	Commensalism
1. In this association both organisms are benefited. 2. Lichens are an example of mutualism between a fungus and an alga.	1. In this association only one organism is benefited while the other is neither harmed nor benefited. 2. Remoras (small fishes) attached to sharks are an example of commensalism.

41. Give two definitions of Niche.
(D.G.K. Board-New Scheme-Group-I-2014-A)

Sol. Two Definitions of Niche: -

a. A niche is defined as the role a species plays in a community including behavior and influence.
b. Niche is also defined as the ultimate distributional unit within which a species is restrained by the limitations of its physical structure and its physiology.

42. Define Autecology with the help of an example.
(D.G.K. Board-New Scheme-Group-I-2014-A)

Sol. Autecology With an Example: -

1 The study of relationship of a single population to its environment is called autecology
2. It accounts for interrelationships between an individual species and its environment.
3. It might study a population of microorganisms, animals, or plants.
4. It is also called population ecology.

Examples: -

a. Study of 50 to 100 plants of soya bean only, in order to know the effect of water pollution on their growth and yield is autecology.
b. Study of single Mago tree in a garden is autecology in nature. The study of chemical pollution on the growth and the yield of 100 mango plants is also autecology.

43. Define Humus.
(D.G.K. Board-New Scheme-Group-II-2014-A)

Sol. Humus: -

The dark partially decaying organic material in the soils produced by the decomposition of vegetable or animal matdater and essential to the fertility of the earth is called humus.

44. Differentiate between Nitrification and De-nitrification.
(G.K. Board-New Scheme-Group-II-2014-A)(Grw-18A)

Sol. Differences Between Nitrification and De-nitrification.

Nitrification	Denitrification
1. Nitrification is the conversion of afmmonia (NH_3) or ammonium (NH_4) to nitrates. 2. It is an foxidation process. 3. Nitrification is accomplished by two groups of nitrifying bacteria (*Nitrosomonas*, *Nitrobacter*). 4. Nitrification is the production of nitrates. 5. It increases soil fertility. 6. Nitrification takes place in well aerated soils because the bacteria responsible for it are aerobic.	1. Denitrification is the conversion of nitrate back to nitrogen gas, which enters the atmosphere. 2. It is a reduction process. 3. Denitrification is accomplished by denitrifying bacteria such as *Pseudomonas*. 4. It is the reverse process of nitrification in which nitrate is converted back into nitrogen gas, which enters atmosphere. 5. Excessive denitrification reduces soil fertility. 6. It is stimulated by water logging, lack of aeration and accumulation of organic matter in the soil because denitrifying bacteria are anaerobic bacteria and they use nitrates as oxidizing agent instead of oxygen.

45. What is Assimilation?
(D.G.K Board-New Scheme-Group-II-2015-A)

Sol. Assimilation: -

In assimilation roots absorb ammonia, ammonium or nitrate that nitrogen fixation and nitrification formed and incorporate the nitrogen into proteins, nucleic acids, and chlorophyll. When animals consume plant tissues they assimilate nitrogen by taking in plant nitrogen compounds and converting them to animal nitrogen compounds.

46. Define mutualism, give one example.
(D.G.K. Board-New Scheme-Group-I-2016-A)

Sol. Mutualism With One Example: -

a. It is the relationship between two organisms in which both the organisms benefit from each other.
b. It is the physiological interdependence of two organisms of different species which are mutually beneficial.

Example: -

Lichens are an example of mutualism between a fungus and alga. Fungus protects the algal partner from strong light and dessication and itself gets food through courtesy of alga.

47. What is the importance of decomposers?
(D.G.K. Board-New Scheme-Group-II-2016-A)

Sol. Importance of Decomposers: -

Decomposers break down complex organic compounds of dead matter (of plants and animals) into simple compounds. They secrete digestive juices into dead decaying plant and animal remains to digest the organic material. After digestion, decomposers absorb the products for their own use. The remaining substances are added to the environment as ions (nitrates, ammonia, phosphatesr, potassium and calcium) that are taken up by the plants. Therefore, the decomposers play an important role in recycling the materials. Otherwise plants would be completely dependent only on physical processes, such as minerals from rocks.

48. What is predation, give its significances?
(D.G.K. Board-New Scheme-Group-I-2017-A)

Sol. A) Predation

a. Predation is the consuming of one organism by other.
b. It is an interaction between two animals of different species or between a plant and an animal. In predation, one organism (the predator) attacks, kills, and feeds on other organism (the prey).
c. All carnivores are predators.

Examples: -

i. Frog preys upon mosquito.
ii. Fox preys upon rabbit.
iii. Cat preys on mouse.
iv. Seal preys upon fish.
v. Hawk preys upon small birds.

B) Significance of Predation: -

The prey-predator relationship is an important factor that influences population size. The sizes of population of predator and prey are related to each other. The size of each population is determined by the size of the other. One population increases, the other decreases and vice versa.

49. Write name and role of nitrifying bacteria.
(D.G.K. Board-New Scheme-Group-II-2017-A)

Sol. A) Names of and Role of Nytrifying Bacteria: -

a. *Nitrosomonas* ----- They convert NH_3 or NH_4 to nitrites (NO_2^-).
b. *Nitrobacter* ------ They convert nitrites into nitrates (NO_3^-).

50. What is nutrient cycle?
(Sahiwal Board-New Scheme-2015-A)

Sol. Nutrient Cycle: -

a. Matter moves in numerous cycles from one part of an ecosystem to another — that is from one organism to another and form living organisms to the abiotic environment and back again. This is called nutrient cycle.
b. The nutrient cycles are also called biogeochemical cycles as the nutrients move from living to non-living and then again to living portions of ecosystem in a cyclic manner.

51. Who and when proposed the term Niche?
(Sahiwal Board-New Scheme-2015-A)

Sol. Who Proposed The Term Niche: -
Joseph Grinnell
When The Term Niche Was Proposed: -
In 1917

52. Name the animals involved in predator / prey interaction as an example.
(Sahiwal Board-New Scheme-2015-A)

Sol. Names of the Animals Involved in Predator / Prey Interaction as an Example: -
Cat/mouse, fox/rabbit, seal/fish, frog/mosquito, hawk/small birds etc.

53. Differentiate between ectoparasites and endoparasites.
(Sahiwal Board-New Scheme-2018-A)
(Lhr-II-19A, Rwp-14, Grw-15)

Sol. Differences Between Ectoparasites and Endoparasites: -

Ectoparsites	Endoparsites
1. These parasites live on or in the outer surface of its host. 2. Ticks, mites, lice are examples.	1. These are the parasites that live within their hosts. 2. *Taenia* (tape worm) living in the intestine of man, and *Plasmodium* living in the blood, are examples.

54. Differentiate between mycorrhizae and lichens.
(Sahiwal Board-New Scheme-2018-A)

Sol. Differences Between Mycorrhiza And Lichens: -

Mycorrhiza	Lichens
1. Mycorrhiza is mutualistic association between soil fungi and roots of most vascular land plants. 2. The photosynthetic partner of a mycorrhiza is any kind of a vascular land plant. The fungus is most often zygomycete or basidiomycete, although in some it is an ascomycete. 3. Both partners get benefit from each other. The presence of the fungus, gives a plant a greater absorptive surface for the intake of minerals. The fungus also benefits from the association by receiving carbohydrates from the plant. 4. Plants with mycorrhizal fungi show better growth. 5. It is found below the soil.	1. Lichen is a dual organism composed of a fungal mycelium within which are embedded photosynthetic unicellular algae or cyanobacteria. 2. The photosynthetic partner of a lichen is either a green laga, a cyanobacterium, or both. 3. Fungus protects the algal partner from strong light and desiccation and itself gets food through courtesy of alga. 4. Lichen can grow at such places where neither of the partner alone can. 5. It is found above the soil.

SECTION III

LONG QUESTIONS

2. Define the following terms: (4) (Lhr-I-16A)
   (a) Habitat (b) Niche
   (c) Food web (d) Succession
   (Lahore Board-New Scheme-Group-I-2015-A)
3. Write a note on nitrogen cycle. (4) (DGK-I-16, 17A, Fsd-17A, Sgd-16, 17A, Lhr-II-14A, Lhr-II-16A, Mtn-II-17A, Mtn-14, 15A, Bwp-14, 16, 18A) (Lahore Board-New Scheme-Group-II-2015-A)
6. Describe predation and parasitism and their significance.(Gujranwala Board-New Scheme-2014-A) (4)
7. Explain the biotic components of an ecosystem. (4) (Gujranwala Board-New Scheme-2015-A)
8. Define ecosystem. Explain its various components. (4) (Grw-17-18A, Mtn-II-18A, Rwp-II-17A, Sgd-18A, DGK-II, 14-I-15A) (Gujranwala Board-New Scheme-2016-A)
9. Explain the Food Chain and Food Web in an Ecosystem. (4) (Multan Board-New Scheme-Group-I-2017-A)(Rwp-19A)
11. What is a food web? How it is constructed to show various trophic levels? (4) (Rwp-16A, 18A, DGK-II-16-18A) (Faisalabad Board-New Scheme-2016-A)
12. Write detailed note on biosphere. (4) (D.G.K. Board-New Course-Group-II-2017-A)
13. Define biogeochemical cycles. Explain nitrogen cycle with the help of diagram. (4) (Sahiwal Board-New Scheme-2015-A)(DGK-I-17A)
14. Discuss nitrogen depletion and its remedies. (4) (Sahiwal Board-New Scheme-2016-A)
15. Define the terms (i) Habitat (ii) Succession (iii) Poineers (iv) Biomass

Chapter --- 26

SOME MAJOR ECOSYSTEMS

1 MCQ

I) From Exercise:-

1) **The soil or terrestrial ecosystems have some adaptations for animals and plants:**
   a) Supporting tissues
   b) Retention of food
   c) Temperature
   d) Nutrients
2) **Most plants fit only into a few ecosystems which type of plants seem to fit into ecosystem of grass land:**
   a) Trees b) Shrubs
   c) Perennial herbs d) Annual weeds
4) **What biome has the richest soil with nutrients and can be converted into agriculture?**
   a) Deciduous forest b) Tropical rain forest
   c) Grass land d) Coniferous forest
5) **Which of the biomes has been increased in area by human activities? (Mtn-15A, Rwp-15A, Fsd-14A)**
   a) Savannah b) Grassland
   c) Desert d) Coniferous

II) From Punjab Boards:-

1) **Desert ecosystem of Bhakhar and Mianwali is called: (Mtn-II-17, Rwp-18A, Sgd-19A) (Lahore Board-New Scheme-Group-I-2014-A)**
   a) Thar **b) Thal**
   c) Cholistan d) Rohi
2) **Which one is not desert? (Lahore Board-New Scheme-Group-II-2014-A)**
   a) Thal b) Thar
   c) Sahara **d) Taiga**
3) **Phytoplanktons are drifting: (Lahore Board-New Scheme-Group-I-2016-A)**
   a) Plants b) Animals
   c) Protozoans d) Crustaceans
4) **The soil of grassland is basically impermeable with excessive: (Lahore Board-New Scheme-Group-I-2017-A)**
   a) Neutral pH b) Acidity
   c) Salinity d) Moisture
5) **The zoological name of leopard cat is: (Lahore Board-New Scheme-Group-II-2018)**
   a) *Felis domestica* b) *Felis leo*
   c) *Felis pardous* **d) *Felis bengalensis***
6) **Northern coniferous forests are also called: (Gujranwala Board-New Scheme-2014-A)(DGK-II-15)**
   a) Savanna b) Prairies
   c) Taiga d) Tundra
7) **Temperate deciduous forests are located in Pakistan at --------- . (Gujranwala Board-New Scheme-2015-A)**
   a) Shogran b) Chilas
   c) Mianwali d) Sindh
8) **Mountains of Kara-Koram and Hindukush are the regions, also called as: (Gujranwala Board-New Scheme-2016-A)**
   a) Deserts b) Grassland
   c) Tundra d) Taiga
9) **The producers in limnetic zones are: (Mtn-II-18) (Gujranwala Board-New Scheme-2018-A)**
   a) Amoebae **b) Cyanobacteria**
   c) Hydrilla d) Crustaceans
10) **Coniferous forests located at high altitude are called: (Multan Board-New Scheme-2014-A) (Lhr-II-15, Grw-19A, Fsd-15A, Sgd-18A, DGK-I-16, DGK-II-18)**
   a) Boreal **b) Alpine**
   c) Arctic d) Tundra

11) A little light is left to power photosynthesis at the depth of:
(Multan Board-New Scheme-2016-A)(Sah-17A)
a) 500 feet **b) 600 feet**
c) 1000 feet d) 1200 feet

12) *Felis bengalensis* is the Zoologist name of:
(Multan Board-New Scheme-Group-I-2017-A) (DGK-I, II-17)
a) Leopard Cat b) Leopard
c) Cat d) Tiger

13) Cacti and Euphorbia are the desert plants which store water in their:
(Multan Board-New Scheme-Group-I-2018-A)
a) Fleshy leaves b) Fleshy buds
b) Fleshy stems d) Fleshy roots

14) Grasslands have no woody plants are also known as: (Bahawalpur Board-New Scheme-2014-A)
a) Prairies b) Sawana
c) Alpine d) Boreal

15) Here light is insufficient to support photosynthesis.
(Bahawalpur Board-New Scheme-2015-A)
a) Littoral zone b) Limnetic zone
c) Profundal zone d) Phytoplankton zone

16) The light in this zone is insufficient to support photosynthesis:
(Bahawalpur Board-New Scheme-2018-A)
a) Limnetic **b) Profundal**
c) Littoral d) Chaparral

17) Deserts usually occur in region where annual rainfall is less than:
(Faisalabad Board-New Scheme-2017-A)
a) 25--50 cm b) 250--270 cm
c) 5--50 cm d) 15-20 cm

18) The scientific name for rhesus monkey is:
(Faisalabad Board-New Scheme-2018-A)
a) *Macaca mullata* b) *Taxus bacata*
c) *Felis catus* d) *Solenoractor libetanus*

19) The biome, which has very fertile soil, rich in organic matter with maximum water holding capacity is:
(Rawalpindi Board –New Pattern-2014-A)
a) Alpine forest
b) Temperate deciduous forest
c) Grassland
d) Desert

20) In Sindh, desert ecosystem is called: (DGK-II-19A)
(Rawalpindi Board–New Pattern-2016-A)
a) Thar b) Thal
c) Sahara d) Gobi

21) Alpine coniferous forests are found on high:
(Rawalpindi Board-New Scheme-Group-I-2017-A)
a) Latitudes b) Longitudes
c) Altitudes d) Slopes

22) In aquatic ecosystem, near shore zone is called:
(Sargodha Board-New Scheme-2016-A)(DGK-II-14)
a) Littoral zone b) Limnetic zone
c) Profundal zone d) Benthic zone

23) Ecosystem present on Land or Soil is called:
(D.G.K Board-New Scheme-Group-I-2015-A)
a) Terrestrial b) Atmosphere
c) Lithosphere **d) Both a and c**

24) Layering is the characteristic of:
(D.G.K. Board-New Scheme-Group-II-2016-A)
a) Tundra b) Desert
c) Taiga **d) Grassland**

25) Dominant plant of deciduous forest is the:
(D.G.K. Board-New Scheme-Group-I-2018-A)
a) Cactus b) Euphorbia
c) Acacia **d) Taxus baccata**

26) Which of the following is drifting animal?
(Sahiwal Board-New Scheme-2014-A)
a) Insect larva **b) Protozoa**
c) Turtle d) Snake

27) Cacti and Euphorbia plants are found in:
(Azad Jammu Kashmir Board-2017-A)
a) Tundra **b) Desert**
c) Grassland d) Savanna

III) From Entry Test:-

1) In -------- zone, light is insufficient to support Photosynthesis. (Entry Test-2007)
a) Desert b) Littoral
c) Profundal d) All of these

2) Living part of ecosystem is: (Entry Test-2013)
a) Lithosphere c) Community
b) Hydrosphere **d) Biosphere**

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

2. List four adaptations in plants and animals for terrestrial ecosystem.

Sol. List of Four Adaptations in Plant and Animals for Terrrestrial Ecosystem: -

1. Supporting Tissues in Plants: -
2. Supporting Tissues in Animals: -
3. Conservation of Water: -
4. Temperature Regulation: -

3. Name three zones in lake ecosystem.

Sol. Names of Three Zones in Lake Ecosystem: -

1. **Littoral zone** -- Shallow water region near the shore with light penetrating the bottom
2. **Limnetic zone** ---- Open water zone away from the shore to the depth of effective light penetration
3. **Profundal zone** --- Zone of deep water under the limnetic zone, beyond the reach of light penetration

4. How many biomes are present in the world, name only five of them.

Sol. Names of Five Biomes Present in the World: -

1. Forest Ecosystem
a. Tropical Rain Forests
b. Conferous Alpine and Boreal Forests
2. Grass Land Ecosystem
3. Desert Ecosystem
4. Tundra Ecosystem

5. Give the names of some major ecosystems on land in Pakistan.

Sol. Names of Some Major Ecosystems on Land in Pakistan: -

1. Temperate Deciduous Forests
2. Conifeous Alpine and Boreal Forests
3. Grassland Ecosystem
4. Desert Ecosystem
5. Tundra Ecosystem

II) From Punjab Boards:-

1. What is limnetic zone? Mention its life.
(Lhr-II-16A, DGK-I-19A, Grw-14)
(Lahore Board-New Scheme-Group-I-2014-A)

Sol. A) Limnetic Zone: -

a. It is the open water zone.
b. It is beyond the littoral zone away from the shore.
c. It extends down as far as sunlight penetrates to permit photosynthesis.

B) Life in Limnetic Zone: -

a. The main producers of this zone are phytoplankton mainly cyanobacteria.
b. Limnetic zooplankton are protozoa, small crustaceans and rotifers.
c. Large fishes spend some of their time in the limnetic Zone.
d. Cyanobacteria (phytoplankton) are eaten by protozoa and protozoa and small crustacean (zooplankton) which in turn are consumed by fishes.

2. What is climate?
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. Climate: -

a. Climate refers to overall patterns of weather that prevail from year to year and even country to country in a particular region.
b. Climate generally changes slowly, over hundreds or thousands of years.
c. The two most important factors that determine an area's climate aremtemperature and precipitation. Other climate factors include wind, humidity, fog, cloud cover, and lightining-caused wildfires.

3. Differentiate between alpine and boreal coniferous forests.
(Lhr-I-15A, I-18A, Mtn-16A, Bwp-18A, Lhr-I-19A, II-19A, Grw-19A, Sah-19A)
(Lahore Board-New Scheme-Group-II-2014-A)

Sol.

Alpine Forests	Boreal Forests
Coniferous forests located at high altitude (usually above 10,000 feet) are called Alpine forests.	Coniferous forests located at high latitude (between 50 and 60 degree latitudes) are called Boreal forests.

4. What is average rainfall in temperate deciduous forests?
(Lahore Board-New Scheme-Group-I-2015-A)

Sol. Average rainfall in temperate deciduous forests is between 750-1500 mm.

5. Give characteristic of profundal zone.
(Lhr-I-17A, I-18A, Mtn-14A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Characteristic of Profundal Zone: -

a. It is the dark zone of deep water beneath the limnetic zone where light is insufficient to support photosynthesis.
b. The source of nutrition in profundal zone is detritus that falls from the littoral and limnetic zone and by incoming sediment.

6. Where is desert ecosystem located in Pakistan?
(Lhr-II-18A, Mtn-I-17, Fsd-17A, Rwp-15A)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. Where Desert Ecosystem Located In Pakistan: -

Desert ecosystem is located in Pakistan often around 20 to 30 north and south latitude and also in the rain shadows of major mountain ranges. It is found in the wester Punjab (Mianwali and Bukhar), southern Punjab (Fort Abbas, Bahawalnagar, Yazman, Bahawalpur, Khan pur, and Rahim Yar Khan) and Sindh.

7. Where Thal and Thar are situated?
(Fsd-14A, Grw-17A)
(Gujranwala Board-New Scheme-2014-A)

Sol. A) Location of Thal: -

Thal is located in Wester Punjab (Mianwali and Bukhar).

B) Location of Thar: -

Thar is located in Sindh.

8. Differentiate between savanna and prairies.
(Ajk-17A, Sgd-16, Bwp-15A, Fsd-14A, 16, DGK-I-15A)
(Gujranwala Board-New Scheme-2014-A)

Sol.

Savanna	Parairie
1. Svanna is tropical grassland. 2. They contain scattered trees. 3. Savanna prefer warm or hot climate. 4. Svanna need more rainfall than parairie. 5. Svanna cover almost half of the Africa.	1. Parairie is temperate grassland. 2. These grasslands do not have woody plants. 2. Parairie prefer temperature that vary from summer to winter. 3. Parairie need less rainfall than savanna. 4. It includes Prairies of North America, Pampas of Argentina.

9. Differentiate between limnetic zone and profundal zone. (Gujranwala Board-New Scheme-2015-A)

Sol.

Limnetic Zone	Profundal Zone
1. It is deep open water zone away from shore. 2. In this zone enough light penetrates to support photosynthesis. 3. Floating algae and cyanobacteria live here. 4. It is inhabited by cyanobacteria, floating algae, protozoa, crustacean and fish. 5. Cynobacteria act as producers which are eaten by protozoa and small crustaceans, which in turn are consumed by fishes. 6. This zone is mineral poor and aerobic (oxygen rich).	1. It is deep water zone below limnetic zone that overlies the sediment at the bottom of the lake. 2. Here light is insufficient to support photosynthesis. 3. Algae do not live here. 4. Decomposers (bacteria and fungi), detritus feeder (snails, insect larvae) and fishes inhabit it. 3. Food drifts into the profundal zone from the littoral and limnetic zones in the frorm of detritus. 4. This zone tends to be both mineral rich and anaerobic (oxygen deficient).

10. What is layering? Give one example. (Lhr-I-17)

(Gujranwala Board-New Scheme-2015-A)

Sol. A) Layering: -

a. Arrangement of different types of grasses in layers is called layering.

b. Layering is the characteristic of grassland.

c. Grassland usually consists of three layers.

B) One Example: -

Tall grasses *(Andropogon, Panicum)* form the first layer of grassland.

11. Differentiate between altitude and latitude. (Gujranwala Board-New Scheme-2016-A)

Sol. Differences Between Altitude and Latitude: -

Altitude	Latitude
The distance between the plane of equator perpendicular to the angular distance on a plane is known as the latitude.	A latitude is defined as the standing distance between the datum line and certain point above that line.

12. Enlist ecosystems in Pakistan. (Gujranwala Board-New Scheme-2018-A)

Sol. List of Ecosystems in Pakistan: -

a. Temperate Deciduous Forests
b. Coniferous Alpine and Boreal Forests
c. Grassland Ecosystem
d. Desert Ecosystem
e. Tundra Ecosystem

13. Differentiate between Phytoplankton and Zooplankton. (Multan Board-New Scheme-2015-A) (Bwp-18A)

Sol.

Phytoplanktons	Zooplanktons
1. Phytoplanktons are photosynthetic organisms, including cyanobacteria, autotrophic bacteria and free-floating algae. 1. Phytoplanktons make their own food through photosynthesis. 2. Phytoplanktons are found on the surface of the water where there is a lot of sunlight. 3. Pytoplanktons release oxygen in the water through the process of photosynthesis.	1. Zooplanktons are non-photosynthetic organisms that include protozoans, tiny crustaceans, and the larval stages of many animals. 1. Zooplanktons survive on other life forms in the water. Phytoplankton is the chief food source for the zooplankton. 2. Zooplanktons prefer darker and cooler area of the water. They travel to the surface of the water during day time 3. Zooplanktons consume oxygen from the water.

14. Write two adaptations for terrestrial ecosystem. (Multan Board-New Scheme-2015-A) (Lhr-II-19A, Rwp-14A, Fsd-15A)

Sol. Two Adaptations For Terrestrial Ecosystem: -

a. Supporting Tissues: -

The land animals and plants have evolved supporting tissues like skeleton in animals and wood (xylem) and other strengthening tissues in plants to support them on land. Without these supporting tissues, land organisms might collapse due to their own weight and the pull of gravity.

b. Conservation of Water: -

Plants and animals have evolved various methods to conserve water in their body, that is, storage of water in their body and prevention of loss of water from the body.

15. Define Desertification. (DGK-II-18A, Ajk-17A) (Multan Board-New Scheme-2016-A)

Sol. See Azad Jammu Kasmir Board Answer No: 2

16. Name three zone in lake ecosystem. (Multan Board-New Scheme-Group-II-2017-A)

Sol. Names of Three Zone in Lake Ecosystem: -

a. Littoral
b. Limnetic
c. Profundal

17. Give the names of some major ecosystems on land in Pakistan. (Multan Board-New Scheme-Group-II-2017-A)

Sol. Names of Some Major Ecosystems on Land in Pakistan: -

a. Temperate Deciduous Forest Ecosystem
b. Coniferous Alpine and Boreal Forest Ecosystem
c. Temperate Deciduous Forest Ecosystem
d. Grassland Ecosystem
e. Desert Ecosystem
f. Tundra

18. Differentiate between Climate and Weather.
(SGD-19A, Rwp-II-17A, Sgd-16A, DGK-II-15, 16, Rwp-19A, Grw-17, Lhr-II-16)
(Multan Board-New Scheme-Group-I-2018-A)

Sol. Differences Between Climate And Weather: -

Climate	Weather
1. Climate is the average daily weather for an extended period of time at a certain location. 2. Climate generally changes slowly, over hundreds or thousands of year.	1. Weather reflects short term conditions of atmosphere. 2. Weather changes rapidly.

19. Define plankton and give its types.
(Bahawalpur Board-New Scheme-2014-A)

Sol. A) Plankton: -

a. They are free-floating, mainly freshwater and marine organisms.
b. They are usually small or microscopic organisms.
c. They are found at different depths of water at different times of the day or at different seasons.

B) Types of Plankton: -

Planktons are generally sub-divided into two major types:

I. Phytoplankton (Greek "drifting plants"): -

a. They are producers that form the base of most aquatic food webs.
b. They include photosynthetic protista, bacteria, cyanobacteria and algae.

II. Zooplankton (Greek "drifting animals"): -

a. They are non-photosynthetic organisms.
b. They include protozoa, tiny crustaceans, and larval stages of many animals.

20. Write soil conditions of Grassland Ecosystem.
(Bahawalpur Board-New Scheme-2016-A)(Mtn-II-18A)

Sol. Soil Conditions of Grassland Ecosystem: -

a. Soil of Grassland Ecosystem is basically impermeable with excessive salinity.
b. Soil moisture is limited to upper layer in which grasses are rooted due to low precipitation and high evaporation. Deeper soil layers are constantly dry.

21. Write the human impact on corniferous alpine and boreal forests. (DGK-II-19A)
(Faisalabad Board-New Scheme-2017-A)

Sol. Human Impact on Corniferous Alpine and Boreal Forests: -

Human's impact on these forests is least due to severity of climate and remoteness. However, deforestation has disturbed this ecosystem.

22. Write the consumers of grassland.
(Faisalabad Board-New Scheme-2018-A)

Sol. Consumers of Grassland: -

a. Invertebrates including insects, and very numerous Grasshoppers. (They are herbivores).
b. Toads --- Amphibians
c. Lizards, Turtles --- Reptiles
d. Foxes and Wolves --- Mammals

23. What is desertification? Write its two harmful effects. (Faisalabad Board-New Scheme-2018-A)

Sol. A) Desertification: -

a. It is the degradation of once fertile land into non-productive desert.
b. It is caused by soil erosion, deforestation and overgrazing by domestic animals.

B) Two Harful Effects of Desertification: -

a. Desertification reduces the productivity of the land, decreasing its ability to support crops or livestock. This loss of productivity of the ecosystem is nearly irreversible.
b. It results massive famines such has occurred in Ethiopia in the mid 1980s.

24. Name any three characters which upset the balance of nutrient cycle.
(Rawalpindi Board-New Pattern-2014-A)

Sol.

25. Differentiate between aquatic and terrestrial ecosystem. (Rawalpindi Board-New Pattern-2015-A)

Sol.

Aquatic Ecosystem	Terrestrial Ecosystem
1. Aquatic or hydrospheric ecosystem covers about 70 % of earth. 2. Water is available abundantly in aquatic system to support life. 3. It absorbs considerable light energy to sustain life. The intensity of light decreases with depth, so at the depth of 600 feet or more, a little light is left to power photosynthesis. 4. Appropriate temperature is present in aquatic system to carry out all metabolic activities. 5. The nutrients in aquatic system tend to be concentrated near the bottom sediments supporting life where light levels are often too low to support photosynthesis. 6. The major factors that determine the quantity and type of life in aquatic systems are energy and nutrients.	1. Terrestrial or lithospheric ecosystem covers only 30 % of earth. 2. Water is limited and very unevenly distributed both in place and in time. 3. It receives plenty of light. 4. Temperature is very unevenly distributed on land in place and time. 5. In terrestrial ecosystem, soil provides abundant nutrients. 6. The major factors that influence the life on land are temperature and amount of oxygen and carbon dioxide in air.

26. Give biological name of Rhesus monkey.
(Rawalpindi Board-New Pattern-2016-A)

Sol. Biological Name of Rhesus Monkey: -

Macaca mullato

27. Give productivity in sub humid tropical grassland.
(Rawalpindi Board-New Pattern-2016-A)

Sol. Productivity in Sub Humid Tropical Grassland: -

Productivity in sub humid tropical grassland is more than 4000 g/m^2.

28. How animals and plants conserve water in terrestrial environment?
(Rawalpindi Board-New Scheme-Group-I-2017-A)

Sol. Conservation of Water by Animal and Plants in Terrestrial Environment: -
Animals and plants conserve water in terrestrial environment by evolving various methods to conserve in their bodies.

29. Give types of organisms present in profundal zone.
(Rawalpindi Board-New Pattern-2018-A)
(Fsd-16A, Rwp-I-17A)

Sol. Types of Organisms Present in Profundal Zone: -
This zone contains very few species. Decomposers (bacteria and fungi) and detritus feeders (such as, snails and certain insect larvae) inhabit it. Many pond fish spend much of their time in this zone.

30. What do you mean by Taiga?
(Sargodha Board-New Scheme-2014-A)

Sol. Taiga: -
a. Northern coniferous forests are called Taiga.
b. Conditions in taiga are harsher than those in the temperate deciduous forests.
c. The winters are longer and colder, and the growing season is shorter.
d. A few months of warm weather are too short to allow trees the luxurious growth of regrowing. As a result, ever green coniferous trees populate taiga, almost entirely with small waxy needles. The waxy coating and small surface area of the needles reduce water loss by evaporation during cold months and leaves remain on the trees year round.

31. What are plankton? Give their two types.
(Sargodha Board-New Scheme-2016-A)

Sol. Plankton And Their Two Types: -
A) Plankton: -
a. They are free-floating, mainly freshwater and marine organisms.
b. They are usually small or microscopic organisms.
c. They are found at different depths of water at different times of the day or at different seasons.

B) Types of Plankton: -
Planktons are generally sub-divided into two major types:

I. Phytoplankton (Greek "drifting plants"): -
a. They are producers that form the base of most aquatic food webs.
b. They include photosynthetic protista, bacteria, cyanobacteria and algae.

II. Zooplankton (Greek "drifting animals"): -
a. They are non-photosynthetic organisms.
b. They include protozoa, tiny crustaceans, and larval stages of many animals.

32. Write names of plants and animals of Temperate deciduous forests.
(Sargodha Board-New Scheme-2017-A)

Sol. A) Names of plants of Temperate Deciduous Forests: -
a. *Texus baccata* b. *Pinus wallichiana*
c. *Berberis lyceum*
d. Many herbs and herbs with height of five meter.
e. Field layer of grasses, ferns and other herbaceous plants
f. Floor layer or bottom layer of mosses, liverworts and lichens

B) Names of Animals of Temperate Deciduous Forests:
a. Macaca mullata – Rhesus monkey
b. Felis bengalensis – Leopard cat
c. Solenarctas tibulanus – Black bear
d. Deer
e. Wolves
f. Earthworms

33. Compare littoral zone with limnetic zone.
(Sargodha Board-New Scheme-2018-A)

Sol. Comparison of Littoral Zone With Limnetic Zone:-

Littoral Zone	Limnetic Zone
1. It is shallow water region near the shore.	1. It is deep open water zone away from shore.
2. Light penetrates to the bottom.	2. It extends down as for as sunlight penetrates to permit photosynthesis.
3. Aquatic plants are rooted in this zone.	3. No rooted plant is present in this zone.
4. Plants in this zone are the most diverse.	4. Owing to depth less vegetation grows here than in the littoral zone.
5. A wide variety of planktons are also found in this zone.	5. Cynobacteria are present in this zone as phytoplankton and producers.
6. Great diversity of animals is also found in this zone.	6. Animal just visit this zone.

34. Compare Thal with Thar.
(D.G.K. Board-New Scheme-Group-I-2014-A)

Sol. Comparison of Thal with Thar: -
Thal is situated in Western Punjab (Mianwali and Bukhar) while Thar is situated in Sindh

35. Explain Limnetic zone.
(D.G.K. Board-New Scheme-Group-II-2014-A)

Sol. Limnetic Zone: -
a. It is the open water zone.
b. It is beyond the littoral zone away from the shore.
c. It extends down as far as sunlight penetrates to permit photosynthesis.
d. The main producers of this zone are phytoplankton mainly cyanobacteria.
e. Limnetic zooplankton are protozoa, small crustaceans and rotifers.
f. Large fishes spend some of their time in the limnetic Zone.
g. Cyanobacteria (phytoplankton) are eaten by protozoa and protozoa and small crustacean (zooplankton) which in turn are consumed by fishes.

36. Differentiate between alpine and boreal forests.
(D.G.K Board-New Scheme-Group-I-2015-A)

Sol. Differences Between Alpine And Boreal Forests: -

Alpine Forests	Boreal Forests
Coniferous forests located at high altitude (usually above 10,000 feet) are called Alpine forests.	Coniferous forests located at high latitude (between 50 and 60 degree latitudes) are called Boreal forests.

37. Give two causes of famine in Sahel in Africa.
(D.G.K. Board-New Scheme-Group-I-2016-A)

Sol. Two Causes of Famine in Sahel in Africa: -
Two causes of famine in Sahel in Africa are:
a. Twenty-five fears of below average rainfall
b. Rapid growth of human population

38. Name any two zones of freshwater lakes.
(D.G.K. Board-New Scheme-Group-I-2017-A)

Sol. Names of Any Two Zones of Freshwater Lakes: -

a. Littoral Zone
b. Limnetic Zone

39. Define limnetic zone. Name living organisms found in it. (D.G.K. Board-New Scheme-Group-II-2017-A)

Sol. Limnetic Zone and Names of Living Organisms Found in It: -

A) Limnetic Zone: -

a. It is the open water zone.
b. It is beyond the littoral zone away from the shore.
c. It extends down as far as sunlight penetrates to permit photosynthesis.

B) Life in Limnetic Zone: -

a. The main producers of this zone are phytoplankton mainly cyanobacteria.
b. Limnetic zooplankton are protozoa, small crustaceans and rotifers.
c. Large fishes spend some of their time in the limnetic Zone.
d. Cyanobacteria (phytoplankton) are eaten by protozoa and protozoa and small crustacean (zooplankton) which in turn are consumed by fishes.

40. Differentiate between hydrospheric and freshwater ecosystems.
(D.G.K. Board-New Scheme-Group-II-2018-A)

Sol. Differences Between Hydrospheric and Freshwater Ecosystems: -

Hydrospheric Ecosystem	Freshwater Ecosystem
1. It is a system in water where living and non-living components exchange material and transfer of energy also takes place within water. 2. It includes salt-water (covering 71 % of surface) as well as freshwater (covering less than 1 % surface) ecosystems.	1. It is one kind of a hydrospheric system. 2. It covers less than 1 % of the surface.

41. What are kinds of coniferous forests and where are they located? (Sahiwal Board-New Scheme-2014-A)

Sol. A) Kinds of Coniferous Forests: -

Following are the kinds of coniferous forests:

a. Alpine Forests
b. Boreal Forests
c. Taiga

B) Location of Coniferous Forests: -

a. Alpine Forests --- Located at high altitude
b. Boreal Forests --- Located at high latitude
c. Taig --- Evergreen coniferous forests of north. As they are located at high latitude, hence are also called Boreal Forests.

42. Enlist some dominant plants that occur in temperate deciduous forests.
(Sahiwal Board-New Scheme-2017-A)

Sol. List of Some Dominant Plants Occurring in Temperate Deciduous Forests: -

a. *Texus baccata*
b. *Pinus wallichiana*
c. *Berberis lyceum*

43. What type of animals are found in littoral zone?
(Sahiwal Board-New Scheme-2018-A)

Sol. Type of Animals Found in Littoral Zone: -

The great diversity of animals in the lake is found in littoral zone.

a. Littoral invertebrate animals include small crayfish and other small crustaceans, insect larvae, snails, flatworms, Hydra.
b. Littoral vertebrates include frogs and their tadpoles, turtles, aquatic snakes and many fishes such as perch, carp and bass.

SECTION III

LONG QUESTIONS

No Essay Type Question According to New Pattern

Chapter ---- 27

MAN AND HIS ENVIRONMENT

1 MCQ

II) From Punjab Boards:-

1) A single chlorine atom can react with ultraviolet rays and destroys and destroy as many as ozone molecules: (Mtn-I-18)
(Lahore Board-New Scheme-Group-II-2018)

a) One million b) Two million
c) One billion d) Two billion

2) The steady and internal state of homeostasis is known as:
(Gujranwala Board-New Scheme-2015-A)

a) Disorder b) Disease
c) Normal health d) Abnormal health

3) The destruction of forests leave the soil barren and this is called:
(Gujranwala Board-New Scheme-2016-A)

a) Deforestation b) Forestation
c) Afforestation d) Reforestation

4) The color of the pure form of ozone (O_3) is:
(Gujranwala Board-New Scheme-2017-A)

a) Whitish b) Yellowish
c) Bluish d) Greenish

5) Total area of the world under cultivation is:
(Multan Board-New Scheme-2014-A)(Fsd-17A, DGK-I-19A)

a) 9 % b) 10 %
c) 11 % d) 12 %

6) Establishment of new forests, where no forests existed before: (DGK-I-15, Sgd-19A)
(Multan Board-New Scheme-2015-A)

a) Deforestation b) Desertification
c) Reforestation **d) Afforestation**

7) **Ozone is the upper layer of atmosphere that filters:** **(Multan Board-New Scheme-2016-A)**
a) IR radiation **b) UV radiation**
c) B radiation d) y radiation

8) **CFCs are produced by:** **(Multan Board-New Scheme-2016-A)**
a) Moving cars b) Industrial machines
c) Air conditioners and refrigerators
d) Aeroplanes

9) **Water present in the form of Frozen Ice Caps is:** **(Bahawalpur Board-New Scheme-2015-A)**
a) 1 % **b) 2 %**
c) 3 % d) 4 %

10) **Some detergents contain a lot of:** **(Faisalabad Board-New Scheme-2016-A)**
a) Sulphur b) Carbon
c) Phosphates d) Carbonates

11) **Water present in form of frozen ice caps is:** **(Faisalabad Board-New Scheme-2018-A)**
a) 1 % **b) 2 %**
c) 3 % d) 4 %

12) **As CFCs rise to the atmosphere, the ultraviolet release:** **(Rawalpindi Board–New Pattern-2014-A)**
a) Flourine **b) Chlorine**
c) Carbon d) Oxygen

13) **Which of the following is renewable resource?** **(Rawalpindi Board-New Pattern-2015-A)**
a) Coal **b) Land**
c) Petrolium d) Natural gas

14) **Ozone Molecule is made up by binding of three atoms of:** **(Rawalpindi Board-New Pattern-2016-A)**
a) Nitrogen b) Hydrogen
c) Oxygen d) Carbon

15) **Treasure of all types of resources is:** **(Rawalpindi Board-New Pattern-2018-A)**
a) Weather b) Climate
c) Environment d) Water

16) **The earth surface covered with water is about:** **(Sargodha Board-New Scheme-2017-A)**
a) 30 % b) 50 %
c) 70 % d) 60 %

17) **The decline in the thickness of ozone layer is caused by increasing level of:** **(Rwp-I-17) (D.G.K. Board-New Scheme-Group-II-2016-A)**
a) Chlorofluorocarbon b) Nitrogen
c) Chlorine d) Caron Dioxide

18) **Utilization of water in irrigation is:** **(D.G.K. Board-New Scheme-Group-I-2017-A)**
a) 70 % b) 80 %
c) 85 % **d) 90 %**

19) **Environmental buffers are:** **(Sah-15, Mtn-II-17, DGK-II-14, DGK-II-19A) (Sahiwal Board-New Scheme-2014-A)**
a) Wild animals b) Abiotic factors
c) Forest d) Clouds

20) **Ozone is an upper layer of atmosphere that filters:** **(Sahiwal Board-New Scheme-2017-A)**
a) UV radiations b) Alpha radiations
c) Beta radiations d) Gamma radiations

21) **About 95 %of our daily energy requirement is filled by:** **(Sahiwal Board-New Scheme-2018-A)**
a) Nuclear energy b) Hydroelectric power
c) Geothermal energy **d) Fossil fuel**

22) **Goiter disease occurs due to:** **(Azad Jammu Kashmir Board-2017-A)**
a) Physical disorder b) Aging
c) Genetics **c) Nutritional deficiency**

III) From Entry Test:-

1) **The cause of acid rain is:** **(Entry Test-2012)**
a) Oxides of carbon
b) Oxides of nitrogen and suphur
c) Oxides of sulphur
d) Oxides of nitrogen

2) **As a result of destruction of ozone layer there is a significant increase in:** **(Entry Test-2013)**
a) Ultraviole radiations c) Nitrogen oxide
b) Green house gases d) Sulphur oxide

3) **High rate of a biological activity in a nutrient rich pond water is called:** **(Entry Test-2013)**
a) Water pollution **c) Eutrophication**
b) Air pollution d) Industrial effects

4) **Ozone is a layer of atmosphere extending from ----- km above earth and absorbs ultraviolent. radiations:** **(Entry Test-2013)**
a) 10—50 c) 5—30
b) 50—60 d) 10—80

5) **The light rays from the sun are absorbed by CO2 and re-rediate as --------- radiations:** **(Entry Test-2015)**
a) Ultraviolent **c) Infra-Red**
b) Indigo d) Green

6) **The gases which are produced by burning of fossil fuels and are responsible for acid rain are:** **(Entry Test-2015)**
a) CFCs
b) CO_2 and CO
c) HCl and Oxides of Nitrogen
d) SO_2 and Oxides of Nitrogen

7) **The decline in the thickness of ozone layer is caused by:** **(Entry Test-2016)**
a) Increasing level of nitrogen oxide
b) Decreasing level of O_2
c) Decreasing level of CFCs
d) Increasing level of CFCs

8) **Chemicals used for destroying agriculture competitors are known as:** **(Entry Test-2017)**
a) Antibiotics c) Disinfectants
b) Pesticides d) Chemotherapeutic agents

SECTION II

SHORT QUESTIONS ANSWERS

From Exercise:

1. What is ozone layer?

Sol. Ozone Layer: -

1. It is layer of atmosphere extending from 10-50 kilometers above earth which contains ozone.
2. Ozone, in its pure form, is a bluish, explosive and highly poisonous gas.
3. Each molecule of ozone gas (O_3) is made up of three oxygen atoms bonded together.
4. Ozone layer filters ultraviolet (UV) radiations (rays) of sun and protects us from these harmful rays of the sun.

2. What do you mean by non-renewable resources?

Sol. Non-Renewable Resources: -

1. These are exhaustible resources.
2. These resources cannot be reused or replaced if depleted or destroyed. They will be finished forever.
3. Some parts of the earth are rich in certain non-renewable resources and others are poor.
4. Modern man is using these resources extensively and they may be depleted very soon.

Examples: -

1. Fossil fuels (coal, oil and natural gas)
2. Various metals
3. Non-metallic minerals

3. What is difference between deforestation and afforestation?

Sol.

Deforestation	Afforestation
1. It is clearing of forests by natural causes or by humans. 2. It leads to desertification.	1. It is the establishment of new forests where no forests existed previously. 2. It prevents desertification.

5. What is water pollution?

Sol. Water Pollution: -

1. The term water pollution is referred to as any type of aquatic contamination.
2. Human activity is the main cause of water pollution.
3. Water bodies which are effected are canals, streams, lakes, rivers and even sea water.
4. The main sources of water pollution are:

a. Incompletely treated sewage
b. Oil
c. Detergent
d. Chemical pollutants from industries

6. Define green house effect.

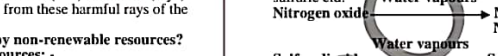
Sol. Green House Effect: -

a. Green house effect is the natural warming of the earth by heat trapped due to presence of certain heat-absorbing gases called green house gases in the atmosphere.
b. On reaching the earth's surface, sunlight, largely short wave length radiation, is converted into longer wavelength heat energy. Carbon dioxide and other green house gases, like man made glass sheet of green house, allow the sun's energy in the form of short wave length to penetrate but do not allow a much of it to escape as heat in the from of long wave lengths (infrared or IR), warming the lower atmosphere. This increase in temperature is known as green house effect.
c. Due to over urbanization, deforestation and industrialization, the concentration of carob dioxide has increased tremendously in the atmosphere which is gradually increasing temperature of earth, now being called global warming.

7. What is acid rain?

Sol. Acid Rain: -

a. Acid rain is a type of air pollution in which sulphuric acid and nitric acids produced by human activity falls to the ground along with rain water or snow.
b. Acid rain is produced when oxides of nitrogen and sulfur emitted in the air during the burning of fossil fuels, combine with water vapors in the atmosphere in the presence of sun light to form nitric acid and sulfuric cid.



c. These acids remain as vapors at high temperatures. As temperature falls, acids begin to condense in liquid form and mix with rain or snow, on the way to the earth. This makes rain acidic called acid rain with pH range of 3 to 6.

8. What is algal bloom?

Sol. Algal Bloom (Eutriphication): -

a. It is also called Eutrification.
b. It is the enrichment of water with inorganic nutrients which promotes the growth of algae leading to increase in the number of the decomposers and depletion of oxygen in water.
c. Accumulation of nitrates from wasing powder and phosphates from fertilizers in the aquatic system leads to excessive growth of algae This is called algal bloom or eutriphication. Water turns green with algal bloom.
d. As there are not enough microscopic animals in the water to eat microscopic algae, as a result they die and are broken down by aerobic bacteria which use up oxygen. Thus algal bloom may result in a serious oxygen shortage in the water and causes death of aquatic animals.

II) From Punjab Boards:-

1. What are renewable resources? Give example.
(Sah-14A, Grw-14A, Mtn-16A)
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. A) Renewable Resources: -

a. Renewable Resources are the resources which are used again and again but are never depleted.
b. They are virtually in-exhaustible and are recycled again.
c. The important characteristic of renewable resources is that they can be expected to remain available for ever, if consumed in a sustained manner.
d. Tempering with the natural environment and pollution can also endanger the continued existence and availability of renewable resources.

B) Examples: -

Air, water, land, solar energy etc.

2. Differentiate between deforestation and afforestation.
(Lahore Board-New Scheme-Group-II-2014-A)

Sol. Exercise Chapter No: 27 Answer No: 3

3. What is deforestation?
(Lahore Board-New Scheme-Group-I-2015-A)

5. See Gujranwala Board Answer No: 5

4. Differentiate between renewable and non-renewable resources. (Sah-14A)

Sol.

Renewable Resources	Non-Renewable Resources
1. They are never depleted. They are recycled in nature. 2. They are inexhaustible. 3. They include various metals, non-metallic minerals and fossil fuels (coal, oil and natural gas)	1. They cannot be replaced once their sources have been totally depleted. 2. They are exhaustible. 3. They include air, water food, land, forests etc.

5. Give the sources and harmful effects of chloroflorocarbons (CFCs)
(Lahore Board-New Scheme-Group-II-2015-A)

Sol. A) Sources of Chloroflorocarbons (CFCs): -

a. Aerosol spray foams
b. Air-conditioning system
c. Refrigerants
d. Vehicles

B) Harmful Effects Of Chloroflorocarbons (CFCs): -

a. Thinning of ozone layer
b. Global warming due to green house effect

6. How can we save energy? (Lhr-I-17, Mtn-I-18A)
(Lahore Board-New Scheme-Group-I-2016-A)

Sol. Saving Energy: -

a. It has been estimated that about 75 % electricity is being wasted through the use of inefficient modern machines and appliances such as motors, heaters, air conditioners, refrigerator etc. So we should choose correct appliance for daily use. It will save electricity.
b. Reduce wastage by recycling.
c. Switch off lights and electrical appliances when they are not in use.
d. Minimize the use of air conditioner.

7. Give the importance of ozone layer.
(Lahore Board-New Scheme-Group-I-2017-A)

Sol. Importance of Ozone Layer: -

Ozone layer absorbs most of the ultraviolet (UV) rays of the sun so that fewer rays strike the earth. Hence it protects earth and its organism from the harmful effects of these rays.

8. What is soil? Give its basic constituents.
(Lahore Board-New Scheme-Group-I-2018-A)

Sol. A) Soil: -

Soil can be defined as the upper layering of Earth's crust.

B) Basic Constituents: -

The basic constituents of soil are:

a. Soil particles
b. Soil air
c. Inorganic Matter
d. Soil organisms

9. What is green house effect? (Mtn-14A, Fsd-14, 15A)
(Gujranwala Board-New Scheme-2014-A)

Sol. See Exercise Chapter No: 27 Answer No: 6

10. Define desertification.
(Gujranwala Board-New Scheme-2014-A)

Sol. Desertification: -

a. It is the degradation of once fertile land into non-productive desert.
b. It is caused by soil erosion, deforestation and overgrazing by domestic animals.
c. Desertification is a progressive process that reduces the productivity of the land, decreasing its ability to support crops or livestock.
d. Human activities are causing the spread of deserts through this process. A dramatic example is occurring in Sahel, which borders the southern edge of the Sahara desert in Africa.

11. What is ozone layer? Give the cause of ozone layer depletion. (Gujranwala Board-New Scheme-2016-A)

Sol. A) Ozone Layer: -

See Exercise Chapter No: 27 Answer No: 1

B) Cause of Ozone Layer Depletion: -

Ozone layer depletion is caused by increasing level of chlorofluorocarbons (CFCs), which contains chlorine, fluorine and carbon. These gases are produced from the air conditioners in our houses, offices, vehicles, and operating refrigerators. These gases (CFCs) release chlorine atoms under the influence of intense short wave ultraviolet radiation at high altitude. Each atom of chlorine reacts with more than 100,000 (one million) molecules of ozone converting ozone to oxygen due to which ozone layer is depleted.

(Note: -The chlorine from CFCs reacts with ozone and reduces its concentration in the ozone layer in the following way:

UV radiations causes CFCs to release Cl atoms:

$$CCl_3F \xrightarrow{UV} Cl + CCl_2F$$

UV creates oxygen free radicles:

$$O_2 \longrightarrow 2O$$

Cl atoms and O free radicals interact with ozone:

$$2Cl + 2CO_3 \longrightarrow 2ClO + 2CO_2$$
$$2ClO + 2O \longrightarrow 2Cl + 2CO_2$$

Net reactions: $2O_3 \longrightarrow 3O_2$)

12. How chlorine is responsible for ozone depletion?
(Gujranwala Board-New Scheme-2017-A)

Sol. Role of Chlorine in Ozone Depletion: -

Chlorine found in CFCs is highly reactive and interacts with ozone to turn it into ordinary oxygen molecules. A single chlorine atom can react with ultraviolet rays and destroy as many as one million ozone molecules.

13. How exhaustable resources are different from inehaustable resources?
(Gujranwala Board-New Scheme-2017-A)

Sol.

Exhaustable Resources	Inehaustable Resources
They are recycled again and again, hence are never depleted. **Examples: -** Fossil fuels (oil, coal and natural gas), metals and non-metallic minerals.	They are once consumed can not be replaced, hence are depleted as they are used. **Exmples: -** Air, water, soil, wild life, forests etc.

14. Why forests are called environmental buffers?
(Sah-15A, Fsd-16A, DGK-II-19A, Mtn-I-17A, Bwp-19A)
(Gujranwala Board-New Scheme-2018-A)

Sol. Why Forests Called Environmental Buffers: -
The sources of CFC's are air conditioners in our homes, offices, vehicles, operating refrigerators and aerosol spray foams.

15. Write a note on forest and climate.
(Gujranwala Board-New Scheme-2018-A)

Sol. Note on Forest and Climate: -

a. Forests extract carbon dioxide and pollutants from the air, thus contributing to biosphere stability.
b. Forests are also valued for their aesthetic beauty and tourist attraction.
c. Forests provide the source of rain which comes from the transpiration of the trees themselves. The clouds which form from this transpired water help to reflect sunlight and so keep the region relatively cool and humid.

16. Differentiate between Pollution and Pollutant.
(Multan Board-New Scheme-Group-I-2018-A)

Sol. Differences Between Pollution and Pollutant: -

Pollution	Pollutant
Pollution is an undesirable change in the physical, chemical or biological characteristics of air, water and land brought about by man's activity that may harmfylly affect huamns and other living organisms.	Pollutant is the component of pollution that pollute air, water or soil.

17. Differentiate between Deforestation and Afforestation.
(Bahawalpur Board-New Scheme-2014-A)(Lhr-I-19A)

Sol.

Deforestation	Afforestation
1. It is clearing of forests by natural causes or by humans. 2. It leads to desertification.	1. It is the establishment of new forests where no forests existed previously. 2. It prevents desertification.

18. How Depletion and Degradation of resources occur on planet earth?(Bahawalpur Board-New Scheme-2017-A)

Sol. Depletion and Degradation of Resources: -
Depletion and Degradation of resources occur on planet earth by one of the following way:

a. Over fishing by man has caused extinction of many species of fishes.
b. Over hunting of wild game animals has led to the distinction of many species of these animals.
c. Deforestation has destroyed natural habitat of animals leading to their extinction.
d. Overuse of water resources has affected the natural recycling process.
e. Over / unwise use of coal, peat and natural gas is not only leading to their depletion but also adding pollution in the environment.

19. Explain Ocean Thermal Gradient as a renewable resource of Energy.
(Bahawalpur Board-New Scheme-2017-A)

Sol. Ocean Thermal Gradient As a Renewable Resource of Energy: -
In oceans, especially in tropical regions, temperature of surface water is about 25 ^{0}C and that at the depth of a few hundred meters only 5 ^{0}C. This develops an ocean thermal gradient and heat is conducted from region of higher to lower temperature. Man has developed the technology to use this thermal gradient to derive a turbine for electricity generation.

20. Explain Ozone Layer?
(Bahawalpur Board-New Scheme-2018-A)

Sol. Ozone Layer: -

1. It is layer of atmosphere extending from 10-50 kilometers above earth which contains ozone.
2. Ozone, in its pure form, is a bluish, explosive and highly poisonous gas.
3. Each molecule of ozone gas (O_3) is made up of three oxygen atoms bonded together.
4. Ozone layer filters ultraviolet (UV) radiations (rays) of sun and protects us from these harmful rays of the sun.

21. Give two effects of Acid Rain.
(Bahawalpur Board-New Scheme-2018-A)

Sol. Two Effects of Acid Rain: -

a. Acid rain damages life in lakes, farms and forests.
b. Acid rain destroys the necessary nutrients present in the waters of rivers and lakes etc. It also washes nutrients (such as calcium and potassium) out of soil.

22. What is ozone layer and its advantage? (Bwp-19A) (Faisalabad Board-New Scheme-2016-A)

Sol. A) Ozone Layer: -
It is layer of atmosphere extending from 10-50 kilometers above earth which contains ozone.

B) Advantage of Ozone Layer: -
Ozone layer protects life from the harmful ultraviolet rays of the sun.

23. What are the causes of green house effect? (Rawalpindi Board-New Scheme-Group-I-2017-A)

Sol. Causes Of Green House Effect: -
Over urbanization, deforestation, industrialization are the causes of green house effect. Due to these three factors, the concentration of carob dioxide has increased tremendously in the atmosphere which is gradually increasing temperature of earth, now being called global warming.

24. Differentiate pollution from pollutant. (Rawalpindi Board-New Scheme-Group-I-2017-A)

Sol.

Pollution	Pollutant
Pollution is an undesirable change in the physical, chemical or biological characteristics of air, water and land brought about by man's activity that may harmfully affect humans and other living organisms.	Pollutant is the component of pollution that pollute air, water or soil.

25. Define water pollution. (D.G.K. Board-New Scheme-Group-I-2014-A)

Sol. Water Pollution: -
1. The term water pollution is referred to as any type of aquatic contamination.
2. Human activity is the main cause of water pollution.
3. Water bodies which are effected are canals, streams, lakes, rivers and even sea water.
4. The main sources of water pollution are:

a. Incompletely treated sewage
b. Oil
c. Detergent
d. Chemical pollutants from industries

26. What is Eutrification. (D.G.K. Board-New Scheme-Group-I-2014-A)

Sol. Eutrification: -
a. It is also called Eutrification.
b. It is the enrichment of water with inorganic nutrients which promotes the growth of algae leading to increase in the number of the decomposers and depletion of oxygen in water.
c. Accumulation of nitrates from wasing powder and phosphates from fertilizers in the aquatic system leads to excessive growth of algae This is called algal bloom or eutriphication. Water turns green with algal bloom.
d. As there are not enough microscopic animals in the water to eat microscopic algae, as a result they die and are broken down by aerobic bacteria which use up oxygen. Thus algal bloom may result in a serious oxygen shortage in the water and causes death of aquatic animals.

27. What is difference between afforestation bad reforestation. (DGK-I-19A) (D.G.K Board-New Scheme-Group-I-2015-A)

Sol.

Afforestation	Reforestation
1. It is the establishment of new forests where no forests existed previously. 2. It occurs slowly.	1. It is the establishment of forests where previously forests existed but had been destroyed due to some reasons. 2. It occurs rapidly.

28. What are the two main sources of water pollution? (D.G.K. Board-New Scheme-Group-II-2016-A)

Sol. Two Main Sources of Water Pollution: -

a. Oil: -
Oil pollution of sea has become a familiar event, to kill life in water, particularly, life dependent on aquatic producers and consumers of other levels.

b. Various detergents: -
Various detergents also enter the water from houses and laundries to pollute with various harmful effects.

29. Why forests are called environmental buffers? (D.G.K. Board-New Scheme-Group-I-2017-A)

Sol. Forests Called Environmental Buffers: -
Forests are called environmental buffer because they intercept heavy rainfall and release the water steadily and slowly to the soil beneath and to the streams and rivers that start in or flow through them. The tree roots hold the soil in place.

30. Enlist four consequences of population increase in Pakistan. (D.G.K. Board-New Scheme-Group-II-2017-A)

Sol. List of Four Consequences of Population Increase in Pakistan: -
a. Over crowding, less living space, more crime, violence and social diseases
b. Starvation through lack of efficient agriculture
c. Populations outstrip food supply
d. Destruction of the countryside, plants, animals and wildlife.

31. Describe role of bacteria in eutriphication. (D.G.K. Board-New Scheme-Group-I-2018-A)

Sol. Role of Bacteria In Eutriphication: -
When aerobic bacteria decompose excessive amount of microscopic algae, when die, they use up oxygen as a result of which a serious oxygen shortage in the water occurs and causes death of aquatic animals.

32. What are the effects of ozone depletion? (Rwp-19A) (D.G.K. Board-New Scheme-Group-I-2018-A)

Sol. Effects of Ozone Depletion: -
Ozone depletion allows more ultraviolet rays to reach the surface of earth. Excessive exposure to UV radiation has following effects on life:
a. UV radiation causes mutation that can lead to melanoma, a type of skin cancer.
b. UV radiation can make the lens of the eye develop cataracts (i.e. lens become cloudy).
c. It may also damage crops and forests.
d. It kills algae (phytoplankton) because it inhibits photosynthesis in these phytoanktons they sustain ocean life..
e. It kills tiny shrimp-like animals (krill) that sustain oceanic life.

33. What are endangered species? Give examples.
(D.G.K. Board-New Scheme-Group-II-2018-A)

Sol. A) Endangered Species: -
A species whose numbers are so severely reduced that it is in imminent danger of extinction throughout all or part of its range (where it lives) is called endangered species.

B) Examples: -
Indus dolphin, Marco Polo sheep, Houbara bustard, Black buck, Common leopard, Great Indian bustard, White-headed duck, and Marbled teal are few examples of Endangered Species in Pakistan.

34. What is acid rain? Write its any two effects.
(D.G.K. Board-New Scheme-Group-II-2018-A)

Sol. A) Acid Rain: -
Acid rain is a type of air pollution in which sulphuric acid and nitric acids produced by human activity falls to the ground along with rain water or snow.

B) Two Effects of Acid Rain: -
a. Acid rain damages life in lakes, farms and forests.
b. Acid rain destroys the necessary nutrients present in the waters of rivers and lakes etc. It also washes nutrients (such as calcium and potassium) out of soil.

35. What are pollutants?
(Sahiwal Board-New Scheme-2014-A)

Sol. Pollutants: -
A. The harmful substances are called pollutants.
B. The pollutants in the air are:
a. Chlorofluorocarbons (CFCs)
b. Carbon dioxide
c. Sulfur dioxide
d. Lead compounds
e. Oxides of nitrogen
f. Carbon monoxide
C. Water pollutants are:
a. Sewage water
b. Oil
c. Detergents such as phosphates and nitrates
d. Industrial effulents
D. Soil pollutants are:
a. Fertilizers
b. Pesticides
c. Trash
d. Organic manure
e. Plastic materials
f. Cans
g. Agriculture and industrial wastes

36. What is Global warming? Write its effects.
(Azad Jammuu Kasmir Board -2017-A)

Sol. A) Global Warming: -
Global warming is the century scale rise in the average temperature of the Earth's climate system and its related effects.

B) Effects of Global Warming: -
a. Ice is melting worldwide, especially at the poles.
b. The sea level has been rising more quickly over the last century.
c. Precipitation (rain and snow fall) has been increased across the globe, on average.
d. Some butterflies, foxes, and alpine planta have moved farther north or to higher, cooler areas.
e. Some invasive species are thriving.

SECTION III

LONG QUESTIONS

3. Explain the phenomenon of eutriphication. (4)
(Mtn-II-17A, Bwp-17, 18, DGK-II-19A)
(Lahore Board-New Scheme-Group-I-2015-A)
4. Define pollution. Describe the causes and affects of water pollution. (4)
(Lahore Board-New Scheme-Group-II-2015-A)(Ajk-17A)
5. Write note on deforestation and afforestation. (4)
(Grw-14A, Sgd-17A, Sah-17A, Fsd-14, 15A)
(Lahore Board-New Scheme-Group-I-2016-A)
7. Describe deforestation. (4)
(Lahore Board-New Scheme-Group-I-2018-A)
10. Write a note on importance of forests. (4)
(Bwp-16A, Rwp-16A, DGK-II-18A, Sah-14A, Lhr-17A, Mtn-14A)
(Gujranwala Board-New Scheme-2016-A)
11. Write a note on greenhouse effect. (4)
(DGK-II-15, 16, Sah-14A, Mtn-15A, Fsd-16A, Bwp-14A, Sgd-19A, Sah-19A)
(Gujranwala Board-New Scheme-2018-A)
12. What are Renewable Resources? Explain any two of them. (4)
(Multan Board-New Scheme-Group-I-2017-A)
13. What are Renewable and Non-renewable resources? (4)
(Multan Board-New Scheme-Group-I-2018-A)
14. Write down a comprehensive note on ozone layer and ozone layer depletion. (4)
(Faisalabad Board-New Scheme-2017-A)(Lhr-II-19A)
15. Write a note on degradation and depletion of resources. (4)
(Faisalabad Board-New Scheme-2018-A)
(DGK-II-17A, Sgd-18A, DGK-I-19A, Rwp-I-17A, II-17A)
17. Explain Green House effect and Acid Rain. (4)
(D.G.K. Board-New Course-Group-I-2014-A)
18. Write a note on modification of Environments. (4)
(D.G.K. Board-New Course-Group-II-2014-A)
19. What is global warming? Give the role of green house effect in global warming. (4)
(D.G.K. Board-New Course-Group-I-2016-A)
20. What are non-renewable resources and explain its two types only. (4)
(D.G.K. Board-New Course-Group-I-2018-A)
21. Describe the causes and effects of acid rain. (4)
(Sahiwal Board-New Scheme-2015-A)(Bwp-15A)
22. Define pollution. Discuss its various types. (Bwp-19A)